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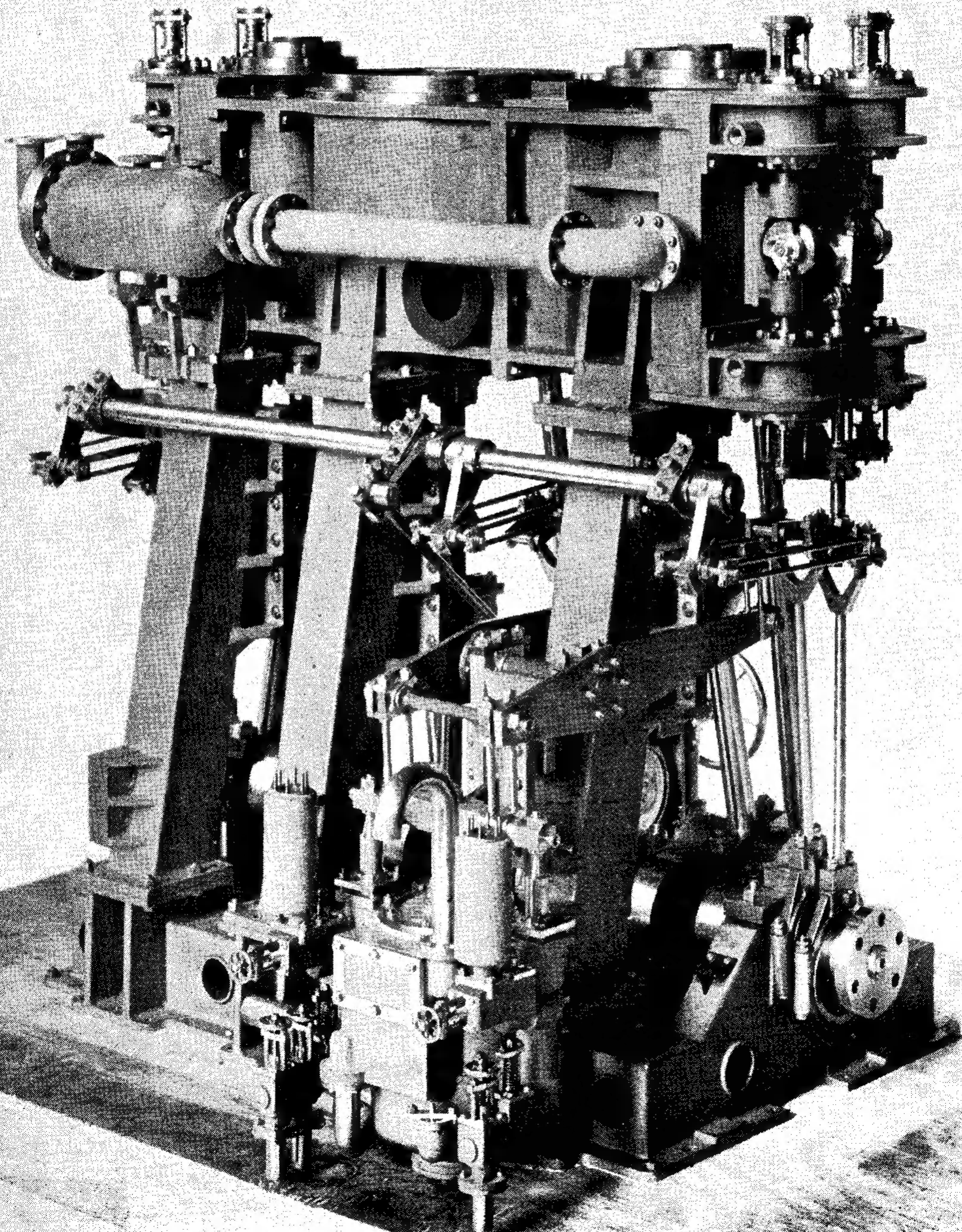
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

27TH MARCH 1952 VOL. 106 NO. 2653

SMOKE RINGS

The Model Railway Exhibition

● THE ANNUAL exhibition organised by our friends of the Model Railway Club will be held this year, as usual, in the Central Hall, Westminster ; the dates will be : Tuesday, April 15th till Saturday, April 19th, next. The times of opening will be 2 p.m. on the first day, 11 a.m. each succeeding day.

The exhibition is, as we have said on previous occasions, the principal event in the model railway calendar, as it brings together the best work of those who practice the hobby. In recent years, this has become even more marked than formerly, due to the ever-growing tendency for the organisers to invite the co-operation of kindred clubs throughout the country. The result is an immense variety of exhibits, most of them of first-class merit, which can only result in impressing upon the minds of the general public the very wide scope of an important hobby. Many of our readers are interested in model railways as such, and should make a note of the dates of this exhibition.

Information *re* Stationary Engines

● OUR RECENT note on the subject of model stationary steam engines, while being warmly welcomed by many of our readers, seems to have been rather misinterpreted by some. We certainly do not intend that the two books we mentioned as being in preparation shall be our only contribution to the search for information ; obviously, they can go only part of the way towards satisfying the need since the subject as a whole is so vast.

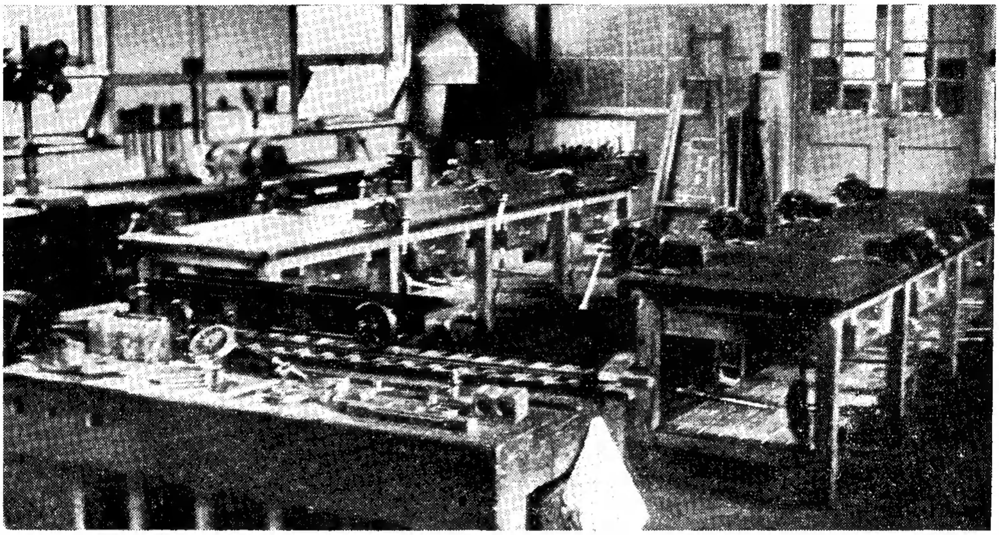
We would remind readers of the new series of articles by Mr. W. J. Hughes, under the title of "Talking About Steam—". In due course, this series will cover steam engines of all kinds, and the information which will be published is being obtained from unimpeachable sources not readily available to many of us.

But this kind of thing takes time because, as we have already stated, a great deal of research is needed to ensure that the information given shall be accurate and reliable. Readers, however, may rest assured that we are fully alive to the interest in the older types of stationary steam engines, and we are doing our best to cater for that interest. We are anxious to avoid rushing the matter, if only to make certain that whatever information we may publish on this subject shall be above suspicion.

We also have in course of preparation an article describing, with drawings and numerous photographs, a fine old pumping engine which, so far as we know, has never been described or illustrated before ; we feel sure that this will give many readers something to enjoy and to think about.

Model Engineering in Schools

● WE WERE recently afforded the opportunity to visit the Gordon County Secondary School, Maidenhead, where model engineering is included in the school curriculum, and we were greatly impressed by the progress which is being made by the pupils.



Besides a modified version of "L.B.S.C.'s" *Minx*, which can be seen in its embryo stage in the accompanying photograph showing a part of the excellently equipped workshop, the boys are producing a number of other useful items, including the tools and fixtures necessary for their completion, under the capable guidance of their instructor, Mr. F. H. Harmsworth.

There is no finer medium than model engineering for developing those qualities which so essentially comprise the foundations of successful manhood, and it was obvious from our conversation that Mr. Harmsworth has long been aware of its merits.

We look forward with interest and enthusiasm to the day when schools, not only in this country, but throughout the entire world, accept and include as an essential feature of their curricula, the study of model engineering as an aid to mental and physical co-ordination.

Tests for Stainless-steel

● SINCE THE publication of "A Sad Story" in "Smoke Rings" for February 28th, many letters have come to hand from readers to remind us that there is one other simple test, provided that there is a magnet available. Stainless-steel is, for all practical purposes, non-magnetic and, therefore, will not adhere to a magnet. Some grades of stainless-steel may be slightly magnetic, but even these can be detected by the feebleness with which they are attracted to a magnet.

Other readers have mentioned the test with a piece of blue-stone (copper sulphate) which is simple enough; all that is necessary is to wet the surface of the steel, then rub it with the blue-stone, and if the steel is stainless there will be no deposit of copper on the surface.

We think that these two simple tests, added to the lesson which he has already learned from his unfortunate experience, will save Mr. Spence from the necessity for profaning the Sabbath or any other day of the week!

We offer our warmest thanks to all those readers who responded to the call.

A Relic of the 1890s

● MR. GEORGE TAYLOR, of Pompton Lakes, N.J., U.S.A., has written to say that he found the article, "Round Town in the Nineties," by B.C.J. most interesting; his letter goes on: "At the present time I have one of those hot-air pumping engines, exactly as B.C.J. describes it, in the basement of my home. Here is the inscription on the brass nameplate:

THE IMPROVED RIDER COMPRESSION ENGINE
No. 962
PAT. AUG. 7, 1879
C. H. DELAMATER & CO., NEW YORK, U.S.A.

"The enclosed photograph (unfortunately unsuitable for reproduction.—ED.) shows a few model engineers at a running of the engine in my home. The fire door is open, showing the fire. The engine was running at about 100 r.p.m. when the picture was taken.

"When we had our fill of running, we shovelled the hot coals out of the engine, but it kept on running for about half an hour, getting slower and slower, finally coming to rest like a ball-bearing electric motor."

The Rider engines were well known in their day, being economical to run and remarkably efficient. We are very interested to learn of one that can still be used if required.

MODEL MARINE STEAM ENGINES

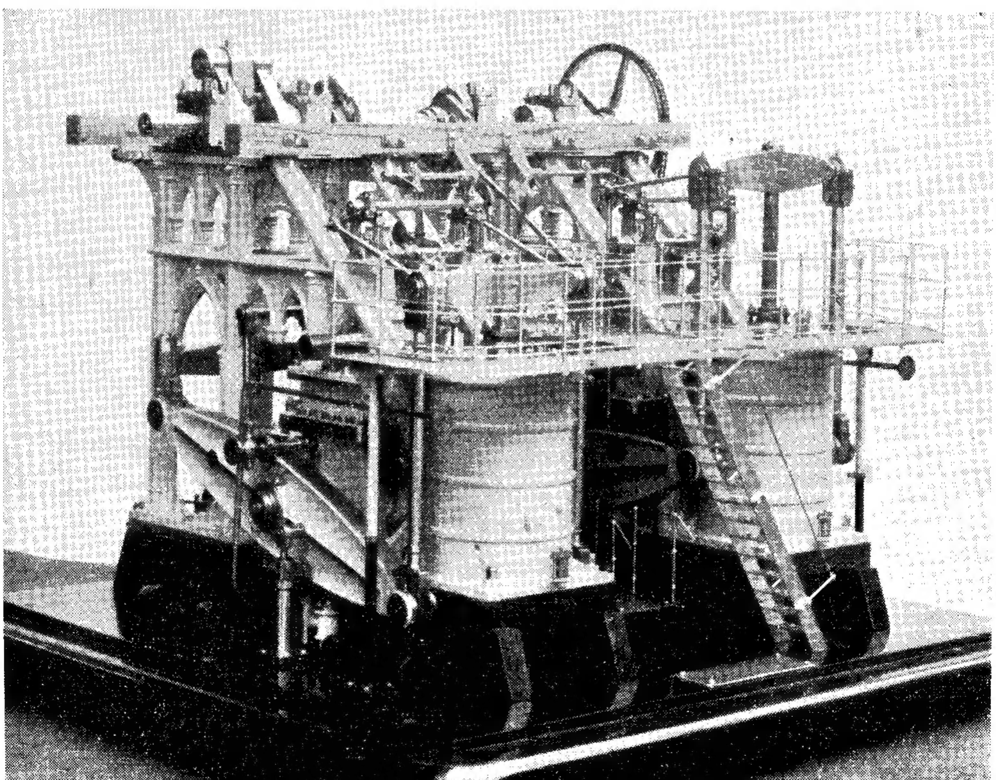
by W. T. Barker S.M.E.E.

I SOMETIMES think it is a pity that so small a fraction of the interest and effort of the model engineering fraternity nowadays gets directed to the marine steam engine. To many besides myself it is the most fascinating of all sections of our hobby but its lack of popularity is scarcely surprising when one realises, for instance, that while the locomotive, rail or road, is or was a common object of the landscape perhaps not one in a thousand have seen a marine engine or are ever likely to. For other reasons also modelling them to any recognisable type or scale is not a job that many would undertake. The would-be builder must have a good acquaintance, to say the least, not only with model work, but with marine engineering, a somewhat comprehensive workshop outfit, a liking for minute detail work and above all a fund of patience and enthusiasm that will sustain his interest over the five to ten years that the construction of such a model may entail.

Add to these the fact that when built it cannot be expected to be an efficient performer under steam due to the practical difficulty of maintaining in a small size engine hot steam cylinders and a cold condenser in close proximity and it will be clear that people of my persuasion cannot expect to have their eyes gladdened very often by marine model descriptions in the pages of THE MODEL ENGINEER.

For over 30 years now I have been enjoying my spare time in building marine engine models and in that time I have completed four, described at intervals in THE MODEL ENGINEER. They form a series showing the evolution of the marine engine during the Victorian era and the accompanying photographs show them in order.

The fifth, to be briefly described later, is



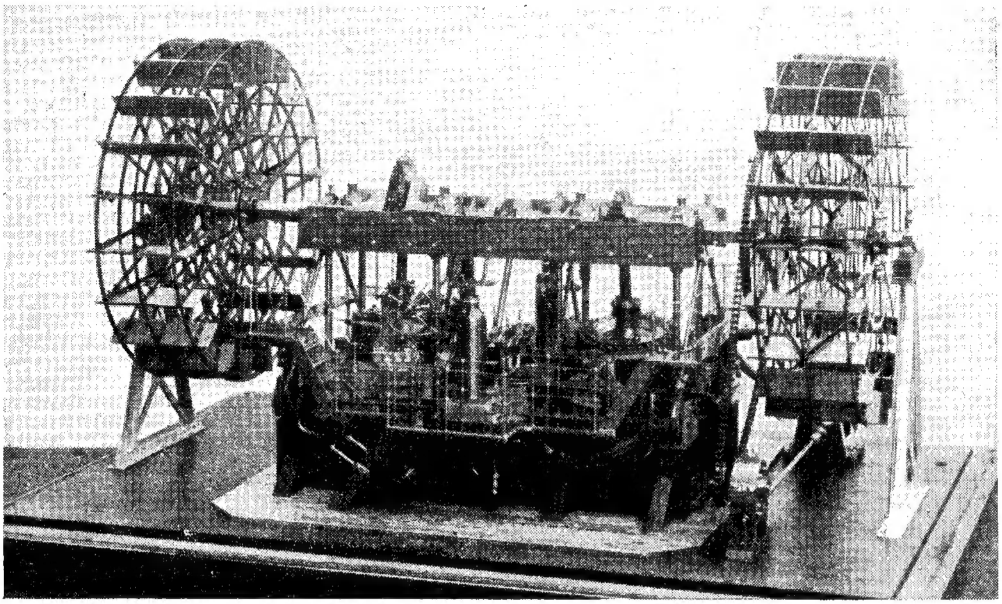
1837.—*Indirect acting side-lever paddle engines*

intended to carry the series forward another 50 years and make the whole set cover the progress of a century. The scale used is approx. ½ in. to 1 ft. and has been dictated by various considerations such as capacity of workshop equipment (my lathe is 2½-in. centres), size of the finished article, etc. A marine engine is a huge and complicated machine and a ½ in. scale model is quite large enough to give house room to.

None of the models are completely accurate reproductions of their originals. The scale is much too small for this and modifications and omissions of detail are inevitable. Even so, some of the detail work is pretty near watchmaking in size. A scale of 1¼ in. to 1½ in. is probably the smallest to which a really accurate and fully detailed marine engine model could be built and it would be a large, heavy and very costly affair, suitable only for a museum. I content myself in this series of models with an attempt to produce reasonably close general overall fidelity.

The model described in these notes is the fifth of the series and although barely half finished it has reached a stage at which perhaps illustrations and some account of it can be of interest. It shows the latest and possibly the really final stage in the evolution of the reciprocating marine steam engine, viz. the reheater type poppet-valve triple expansion engine introduced by the North Eastern Marine Engineering Co. Ltd., and first installed in a sea going ship in 1937. The prototype has cylinders 23½ in. × 38 in. × 66 in. × 45 in. stroke and with a boiler steam pressure of 215 lb. sq. in. develops about 2,600 i.h.p. at 88 r.p.m.

The reheater principle applied to these engines is not complicated and was used in land power installations for some time before being employed in marine work. Boiler steam is superheated to about 730 deg. F. and at this temperature passes through a reheater chamber on its way to the H.P. cylinder. During this passage it reheats the H.P. cylinder exhaust from about 370 deg. to 530-540 deg. F. before it reaches the M.P. engine. In achieving this, of course, it loses some of its superheat so that it reaches the H.P. cylinder at about the same temperature (530-540 deg. F.).

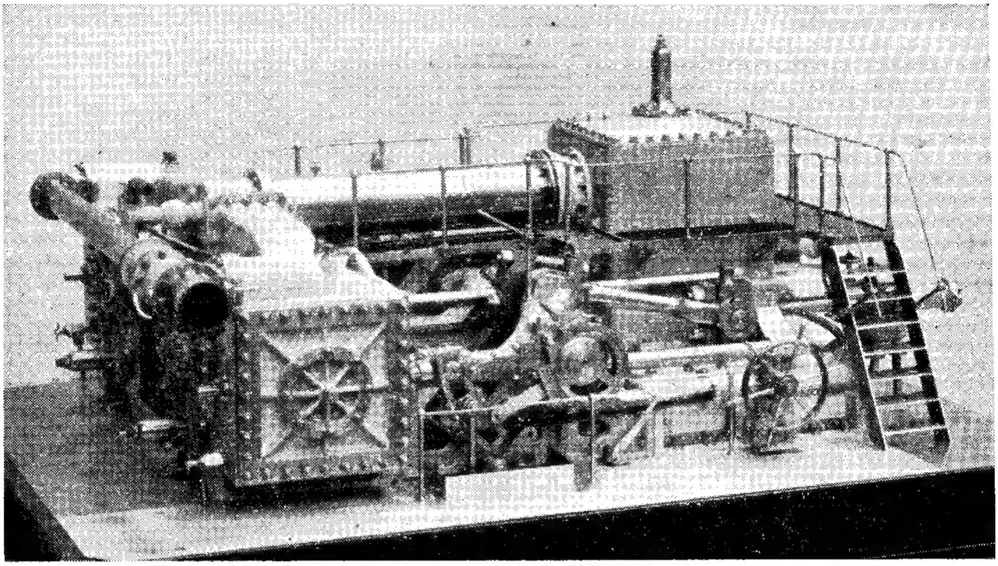


1847.—*Direct acting oscillating cylinder paddle engines*

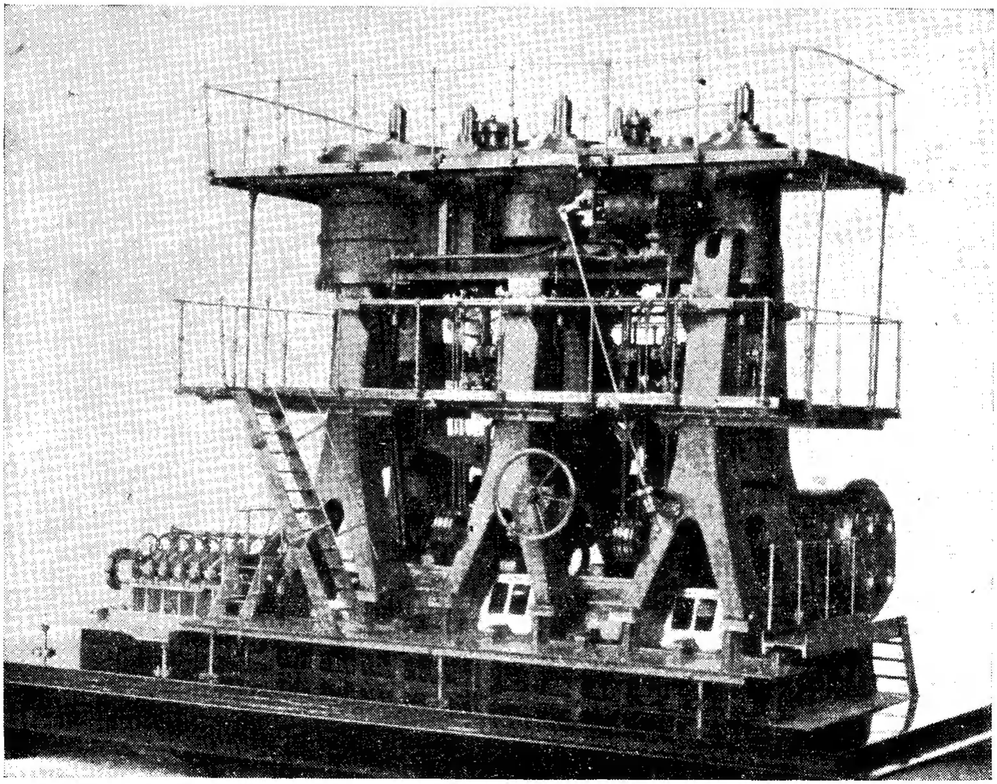
On account of these high steam temperatures, double beat or equilibrium poppet valves are employed both for inlet and exhaust in the H.P. and M.P. cylinders and the valve spindles have no glands. They rely quite adequately on numerous labyrinth grooves and long accurately fitting guides in the centre of which is a small annular recess for oil supply from a pump. The L.P. cylinder has a flat slide-valve of the Andrews & Cameron equilibrium type or very similar to it. It could be simply described as a sort of rectangular piston valve with no rings and which exerts no pressure whatever on the valve face. In rough sea-going parlance a "match-box" valve which really describes it quite well. All the pressure is exerted on the static outside of the box and none acts on the interior sliding portion despite the fact that the steam passes freely through it to the steam ports in the valve face.

The model is a close approximation to ½ in. scale and has cylinders 1 in. × 1⅝ in. × 2¾ in. × 1⅝ in. stroke. Its height is about 11 in. overall by 11 in. long and 8¼ in. wide.

The stroke is rather shorter than scale for two very good reasons. One is that in working as



1857.—*Return acting simple expansion horizontal screw engines*



1887.—*Vertical triple expansion screw engines*

closely as possible to overall dimensions of height clearances always work out much tighter in a small model than in the prototype and have to be allowed for. If I had used the full stroke overall height would have had to be overscale. The other reason is that in the course of many years' building of marine models one accumulates innumerable special tools and jigs which, with care in designing, can be used again and again. Amongst these I had a set for machining and assembling $\frac{13}{16}$ in. throw crankshafts.

The only castings used in the model are for the three rear columns and the main segments of the bedplate. The latter is a simplification of the original. It should be in two sections but it seemed to me an unnecessary complication and rather liable to get out of alignment. This happened once to one of my earlier models through being in blazing sunlight at the S.M.E. jubilee exhibition in 1948. It warped the wooden base slightly and caused me a lot of trouble. Even as it is the bedplate is built up of some 160 pieces and, as a matter of fact, the present-day practice of the engine builders is, I believe, towards using bedplates fabricated by welding, though the photographs they sent me showed a cast one.

The cylinders again are fabricated of gunmetal pieces, all carefully machined and fitted together by pegs and screws and silver-soldered; they are also considerably simplified as can be noticed from the photographs. They will, of course, be entirely hidden by the lagging when the engine is finished. The poppet-valve chests are built-up as separate units and bolted on instead of being in one piece with their respective cylinders but I could not have machined them on my small lathe otherwise. There are four poppet-valves to each cylinder (the steam inlet pair on one side and the exhaust pair on the other) and the method of actuation by a small cranked cross-shaft carrying steam and exhaust cams and driven by normal Stephenson link motion is clearly visible in all three photographs.

The reheater unit can be seen at the rear of the H.P. cylinder with its two connections on the front cover for steam inlet from boilers and outlet to main stop valve. Between these two the steam passes through numerous small tubes in the reheater chamber outside of which the H.P. exhaust passes round a series of deflecting baffles on its way to the M.P. cylinder. A concertina type expansion joint is put in between the reheater chamber and the M.P. steam pipe.

There is not much more about the model, so far as it has got at present, to call for special comment; the air pump is the well-known Edwards type and it is intended eventually to drive it at about 40-50 r.p.m. by means of a small electric motor and the drive will be hidden inside a Mitchell type thrust block casing.

The photograph on the cover, shows the rear view of this model from the H.P. end.

It occurs to me that it might possibly be of interest to some readers if I were to finish up with a few comments on some little points of constructional work which one seldom sees referred to in THE MODEL ENGINEER and which present many minor problems of their own.

Anyone attempting to model marine engines to so small a scale as $\frac{1}{2}$ in. to 1 ft. has to be prepared for a lot of detail work almost of the watchmaking order. I myself have never found it possible to keep exactly to scale in detail and it has always been necessary to compromise and this means taking constant precautions to prevent those inevitable disproportions that do exist clashing with their surroundings and so becoming very painfully obvious. It is a thing very evident in the competition sections at most model engineering exhibitions and I could wish that more of the entrants were on their guard against it. To illustrate: in this model the cam cross-shaft mechanism is distinctly oversize (scale dimensions would be too fragile to operate safely) but so is the rest of the valve motion, bolts and nuts on the cover plates, etc., so that as a whole it is hardly noticeable. Even so, the link motion is what many might think quite fragile enough. Links are $\frac{3}{16}$ in. $\times$ $\frac{1}{16}$ in. section, link pins $\frac{1}{8}$ in. dia., drag link pins, 3/32 in., draglink rods $\frac{1}{16}$ in. dia. with 14 B.A. screwed ends where they hold the draglink brasses, 12 B.A. bolts in eccentric-rod top-end brasses, 16 B.A. in the link-blocks, etc. For approximately exact proportion all these should be from 1 to 2 B.A. sizes smaller than they are.

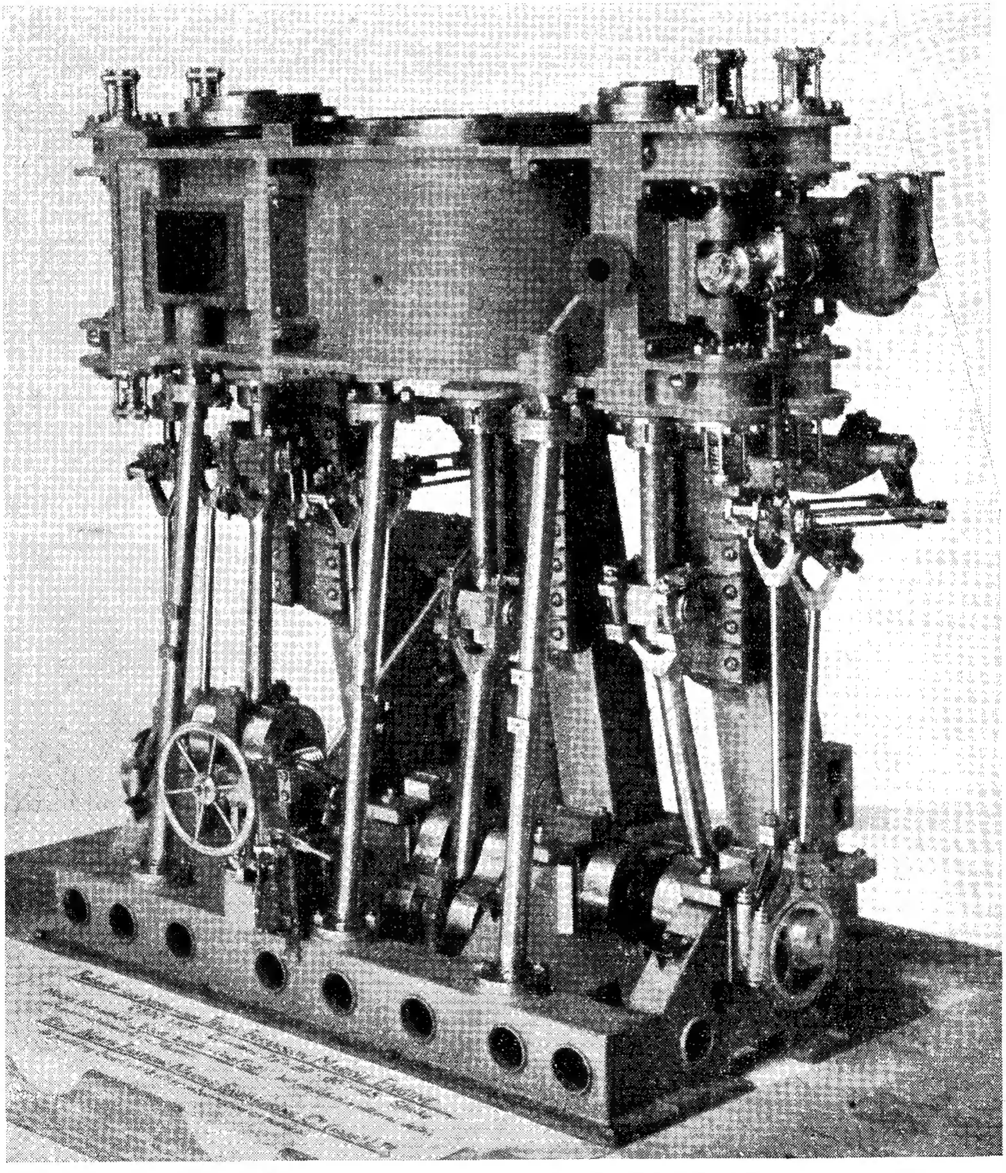
One of the most important factors in disguising or minimising the effect of unavoidable scale errors is the discriminating and careful use of bolts and nuts. I have often smiled over criticisms in THE MODEL ENGINEER of the deadly sin committed by some in using cheese-headed screws where studs and nuts should be, but all too few, even of the critics, seem to realise that to see a cylinder cover, for instance, which ought to have about 20 studs and nuts $\frac{1}{16}$ in. dia. round it actually bolted down by six $\frac{3}{16}$ in. hexagon headed screws looks just as bad if not worse. On a vertical marine engine, cylinder covers are usually very prominent and, speaking from memory only, a 24 in. H.P. cover would have, say, 24 studs about $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in. dia., the M.P. cover about 36, and the L.P. about 60, $\frac{7}{8}$ in. or 1 in. dia. In $\frac{1}{2}$ in. scale they would correspond to, say, 11 B.A. and 13 B.A., but if one used those sizes in such a prominent position in a model one would soon get into difficulties with closely adjoining components, so I usually start a bit oversize with cylinder cover studs and, of course, rather fewer in each cover; 16, 24 and 40 respectively, and 9 B.A. in H.P., and M.P. covers, 10 B.A. in the L.P. The eye takes in the covers as a group in proportion and does not notice the minor detail that the flanges are a little bit too wide and I have six B.A. sizes left to play with for smaller items. I do not usually go lower than 16 B.A. though that size (.031 in. dia.) is equivalent to $\frac{3}{4}$ in. in $\frac{1}{2}$ in. scale.

It is lucky that I am fond of making bolts and nuts and in the course of years have accumulated quite a little outfit of special tools for producing them in sizes from 9 down to 16 B.A., as many hundreds are needed on a model triple expansion engine and the commercial articles are quite unsuitable being altogether too large and clumsy, though I do use some bought nuts after reducing them in size. Long ago I adopted a private standard of my own for hexagon nuts and bolt heads of 1.7D across flats, i.e. a 16 B.A. nut is

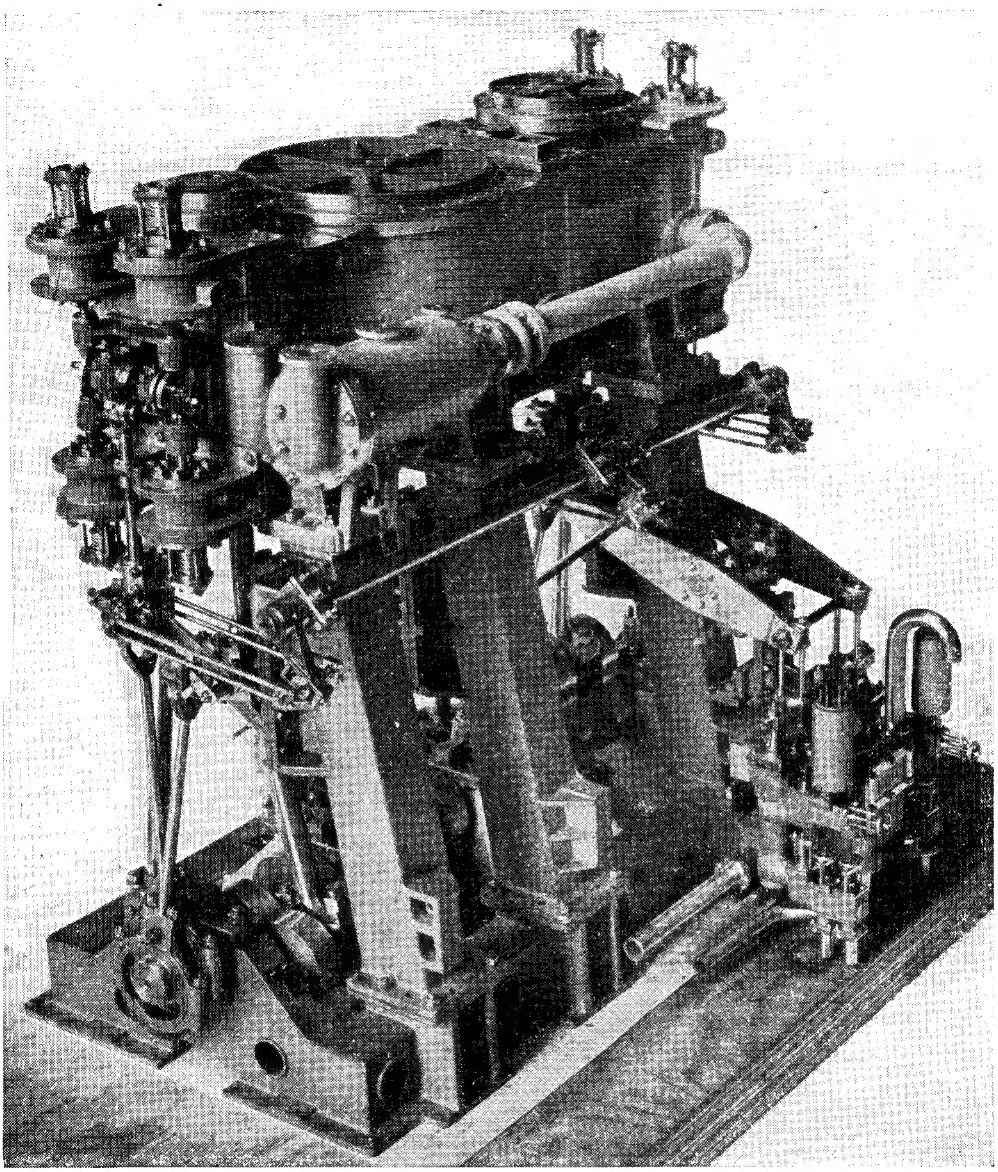
0.053 in. across flats, 14 B.A. 0.67 and dropping to 1.6 D for 12, 11 and 10 B.A., and to 1.5 D. for what I call large sizes *viz.* 9.8 and 7 B.A.

This, of course, means special spanners and, in fact, to erect a small scale model in which a large part of the detail work is most difficult to reach requires a host of tiny spanners, mostly of the ring and box type—something that won't slip off a nut that you can hardly see when you have wangled it into position. I use about 100 various shapes and sizes, such as short ring spanners pivoted at the ends of long thin rods which can be held in a pin vice and poked in where no fingers can reach—others, a whole range, are tiny little box spanners soldered to the ends of pieces of $\frac{1}{8}$ in. dia. flexible wire cable (old speedometer drives). With these one can get round corners or dodge obstructions and particularly get a nut entered upon its bolt or stud and run down in a place where not only can you not reach it in any other way ; sometimes it is not even very easy to see it.

All these little complexities, and, indeed, many others of a similar kind, are amongst the pleasures



1937.—*Reheater poppet-valve triple expansion engines*



1937—Back view (condenser omitted)

of the small scale marine engine modeller and, in addition, I find it good healthy exercise. It might be possible, I suppose, to do the job with power-operated tools but I'm sure I couldn't. My major [*sic*] workshop equipment comprising—Adams lathe, $2\frac{1}{2}$ in. centres, watchmaker's lathe, adapted for making small hexagon nuts, $\frac{1}{4}$ in. drilling machine, Boley vertical miller and planer, is all treadle or hand-operated and it must, of course, be admitted that machining some of the larger components can be, at times, a lengthy and arduous physical labour of love.

In conclusion I have to thank the North Eastern Marine Engineering Co. Ltd., and acknowledge my indebtedness to them for supplying drawings, photographs and other information required and, although I have to confess that in minor detail I have had to abandon strict adherence to my prototype, I hope that by the time the model is finished departures and omissions will only be noticeable to close and expert examination.

Novices' Corner

Stamping Figures with Hand Punches

MANY accessories and fittings made in the workshop, such as index collars and linear scales, have to be numbered so as to indicate the value of the readings denoted by the graduation lines.

Commercially, these figures are either machine engraved or they may be impressed by means of a die or roller specially adapted for the purpose. In the small workshop, however, this figuring is nearly always done with a set of hand stamps, and, if the finished work is to have a good appearance, it is essential that these stamps or punches should be accurately applied and correctly manipulated. Moreover, a faulty impression can only be satisfactorily erased by resurfacing the work-piece and, as the figuring is usually the final operation, this means removing at the same time the index lines or scale markings previously cut. However, by taking reasonable care, there is no need to make mistakes, and all figure-marking appearing in the accompanying photographs was carried out with the rather rough form of punch illustrated on the left of Fig. 1, and by relying on the eye alone to obtain correct alignment. Letter punches may also be employed at times, but, as they are used in the same way as figure stamps, they need not be separately considered.

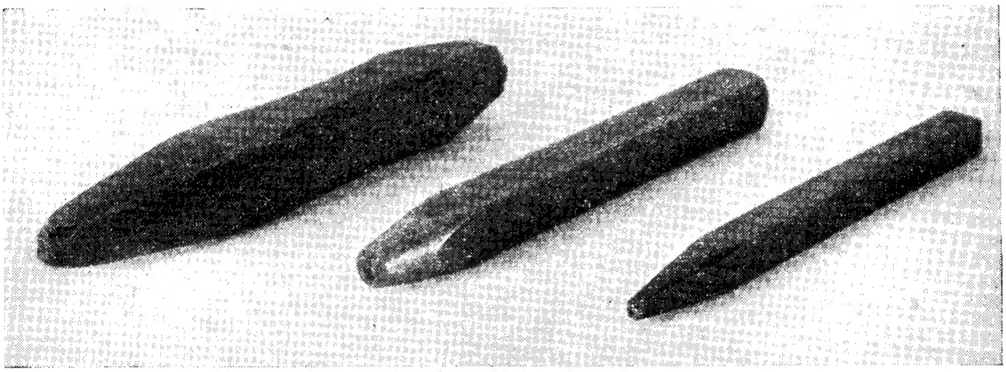


Fig. 1. Three patterns of figure punches

Figure Punches

The punch shown on the left of Fig. 1 has a roughly-formed and rather clumsy shank and, for this reason, may be found somewhat difficult to align correctly ; in addition, the die portion at the tip is, in this particular set, not always in

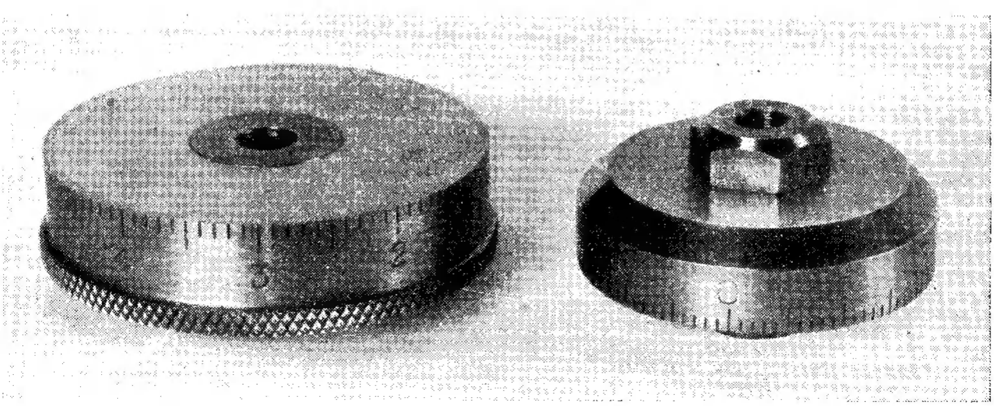


Fig. 2. Two feedscrew index collars made for a Myford M.L.7 lathe

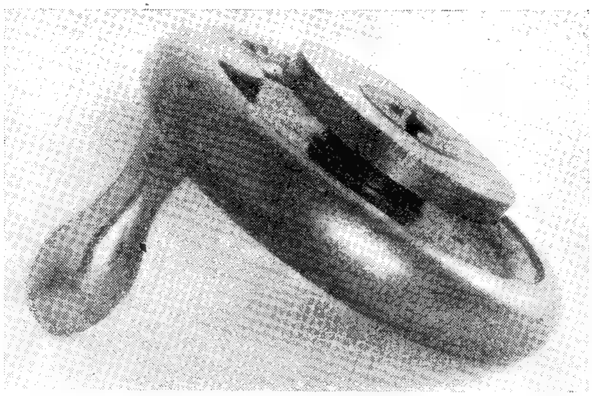


Fig. 3. A leadscrew index fitted to a Drummond lathe

line with the faces of the shank. This means that the individual punches have to be specially aligned if the impressions are all to stand upright. The best-quality punch seen in the centre of Fig. 1 is one of a set obtained from the Imperial Typewriter Co., of Leicester, and these stamps are manufactured to the same degree of accuracy as the type used in typewriters. The characters are of exactly uniform size and have the same depth and angle of bevel; furthermore, the square shanks are finished to within 5 thousandths of an inch of the nominal size. The small punch on the right of Fig. 1 belongs to a set of rather poor quality, for the die portion is somewhat brittle and is apt to chip.

Using Hand Stamps

Punching the figures on a graduated index collar is a representative piece of work and may be taken as an example to illustrate the method used. In the first place, the collar must be firmly gripped in the vice between soft clams or strips of cardboard; in addition, the work is supported from below on a block of brass or aluminium covered with a piece of thin card to protect the surface. The figures from, say, 0 to 9 will be marked at the ends of the index lines denoting tens, and the collar is, therefore, set in the vice with a long line uppermost and turned towards the operator. Before going further, place a piece of card on the bench and strike an impression on it with the punch; this is to make sure that the punch is the right way up, and this test should be made whenever a fresh punch is handled. The impression obtained will also show if the die is out of line with the shank, and will enable the necessary correction to be made when applying the punch to the work.

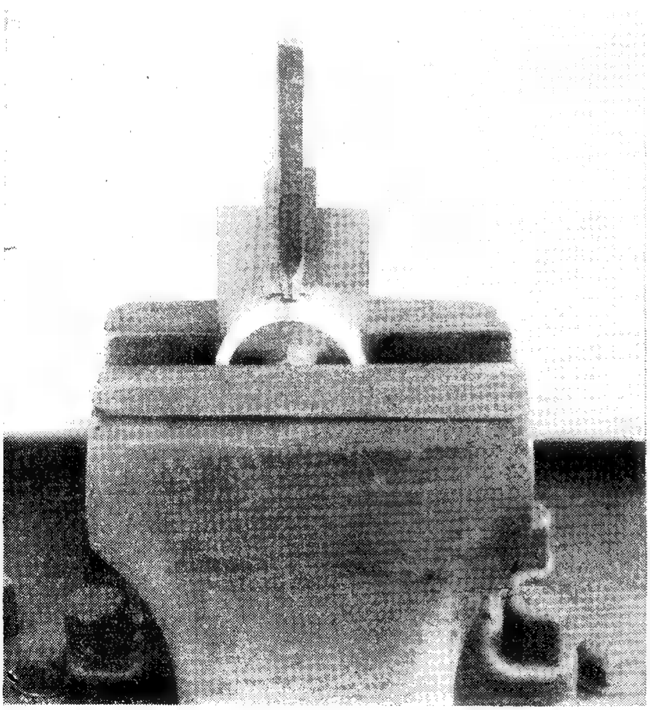


Fig. 4. Using a guide strip when marking an index collar in the vice

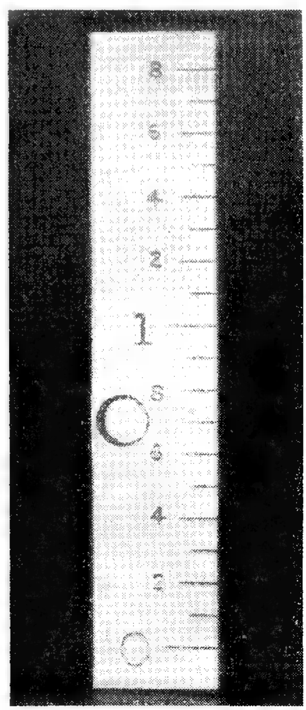


Fig. 5. Showing the figures punched on a small linear scale

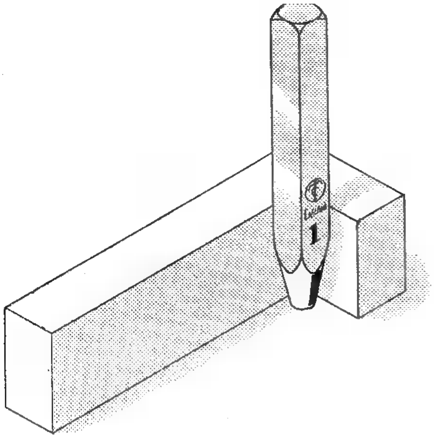


Fig. 6. An L-shaped punching guide

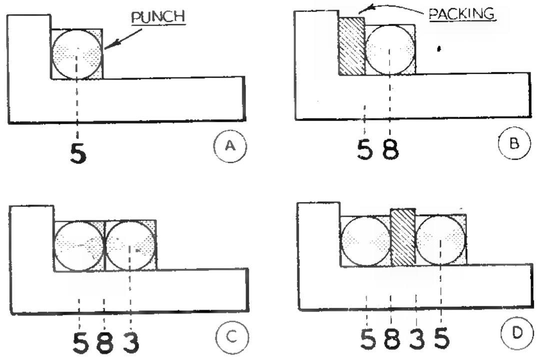


Fig. 7. Showing the method of stamping a number of figures in line and at equal intervals

Next, place the end of the punch exactly opposite to the index line and, if necessary, allow an appropriate spacing ; usually the impression will nearly meet the end of the line, but, if a wide interval has to be given, it is then advisable to mark this with a pencil line running right round the work. Hold the punch vertical and strike the end of the shank a light but firm blow with a hammer of moderate weight. On lifting the punch, the form of the impression will show if the stamping has been started properly and if any correction is needed. If the near and farther parts of the impression do not appear to be of equal depth, the punch is reseated, and the shank is slightly tilted towards the shallow end of the figure ; another blow is then struck and the impression is again checked. To obtain an even depth on a curved surface, the punch is first tilted to one side and then to the other as the hammer is used. A series of light blows can be struck, but care is needed to keep the punch from bouncing out of the impression and making false marks. When the first figure has been correctly formed, the work is reset in the vice, to bring the second long index line uppermost, and the stamping process is repeated. Mistakes have occurred of marking an index collar with the numbers running in the wrong direction ; this can, however, be avoided by writing the numbers with a grease pencil before starting work. Make sure, too, that the numbers are stamped to read the right way when the finished index is mounted in place on its feedscrew. If any difficulty is experienced in maintaining an even distance between the impressions and the ends of the index lines, it may help to use a guide strip in the way shown in Fig. 4. Here, a piece of flat steel strip is gripped between the collar and the vice jaw, and a second metal strip is used as a gauge to locate the punch correctly from the back face of the work.

When the punch is driven into the work, the surface surrounding the marking will become slightly raised, and these burrs must be removed in order to give the impressions a clear-cut appearance.

This smoothing is, perhaps, best done with a very fine Swiss file, and the surface can be afterwards finished by applying a strip of worn abrasive cloth to the collar while it is rotating in the lathe.

Marking Scales

Figure punches are used for marking scales in very much the same way as in the previous example, but the process is made easier by the work surface being flat. If the scale is gripped in the vice and supported on a block, the vice jaw itself can be used as a guide for locating the punch against a strip of the right thickness, and also to enable the figures to be stamped in line.

In the small rule illustrated in Fig. 5 it will be seen that two different sizes of punches have been used for stamping the figures ; a second guide strip may, therefore, be required when punching the smaller set of figures. Here, again, the burrs set up by the punches should be removed by careful filing, and a final polish is given with a strip of very fine, worn abrasive cloth held flat on the surface plate.

A Simple Punching Guide

When stamping a number, consisting of several figures, the punches can be kept in line and evenly spaced by using a guide of the pattern illustrated in Fig. 6.

The guide is clamped to the work and the first figure is stamped with the punch held against the two limbs of the *L*, as represented in Fig. 7A. To align the next numeral—Fig. 7B, the second punch is located by means of a spacing strip half the width of the punch itself. Figs. 7C and 7D show the method of stamping the succeeding numerals by using first a punch and then a punch together with the spacing strip, so as to obtain the correct intervals between the remaining figures.

OSCILLATING CYLINDERS

by H. H. Nicholls

HAVING been asked by the Editor to pen a few notes upon this subject, with explanatory sketches, as ■ follow up of my previous article on the "Oscillating Principle" in the January 21st issue, I now show several more ways in which the oscillating cylinder may be employed either as ■ pump or power unit.

In the sketch (Fig. 1) is shown ■ cylinder driven from a large shaft by means of an eccentric sheave and ■ strap formed integrally with the plunger. The shaft is seen at *a*, *b* is the sheave which may be turned upon the shaft itself, *c* is the strap with the plunger *d* formed as part of the same forging, *e* is the cylinder barrel, *f* ■ "leather" packing (which may, although the shape of a normal cup leather, be composed of one of the new materials which resist oils and chemicals under great pressures), *g* is the hole by which oil or hydraulic liquid enters or leaves the cylinder, *h* indicates ■ centre drilling left on the strap so the strap and plunger together can be put in the grinding machine to finish-grind the plunger. At *i* is the position of the trunnion, while *j* indicates ■ locknut upon one of the bolts joining the halves of the sheave.

Pumps of this character have one great advantage; there are no cams or springs, or diaphragms, to go wrong; the failure of such things in ■ lubricating system can have the most serious consequences.

Fig. 2 shows another pump where the cylinder, driven from the shaft *a* by the crank disc *b*, is screwed into ■ circular block which works in ■ recess of the casting *h*, in which the port face is formed. At *d* are shown a pair of piston rings, and at ■ ■ cup "leather," while there is ■■ extension piece to fill up the volume of the passage between cylinder and port to prevent air being trapped there. At *f* is a sealing ring, while *g* indicates the bosses in which are tapped the connections for suction and delivery. Of course, this pump has, when assembled, ■ cover attached by screws in the three tapped holes shown in *n*. It will be seen that the plunger *c* and the bushed eye for the driving pin are formed in one piece.

In Fig. 3 is another way to make an oscillating

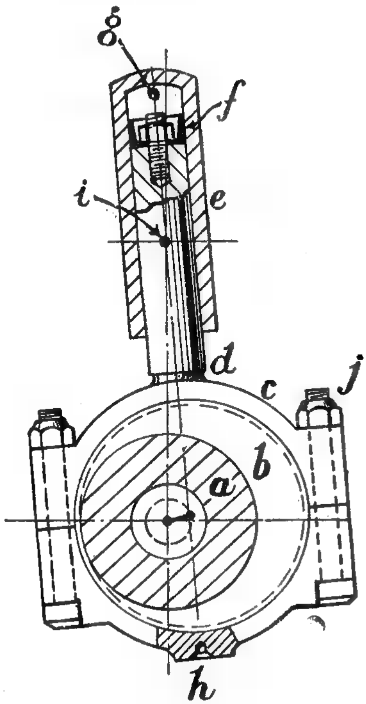


Fig. 1. Oscillating oil pump

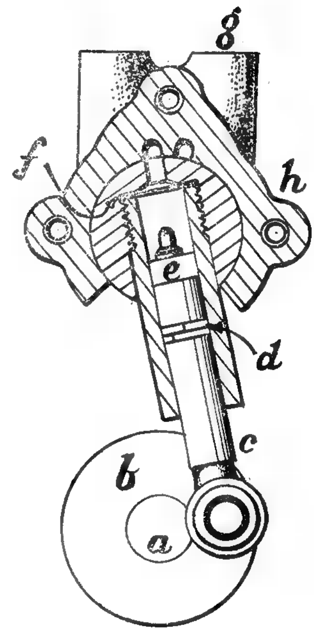


Fig. 2. Another form of oscillating oil pump

cylinder, by having the pivot of the cylinder made very large, and conical. At *a* is the cylinder, *b* the main casting of the engine, *c* the large pivot, *d*, *e* is the usual spring and nut arrangement for holding the cylinder up to its work, the spring *e* being, of course, made as weak as can be to perform its task.

At *f*, exposed by the " broken " line in the drawing, is the requisite clearance at the bottom of the cone, so that the pivot and the moving

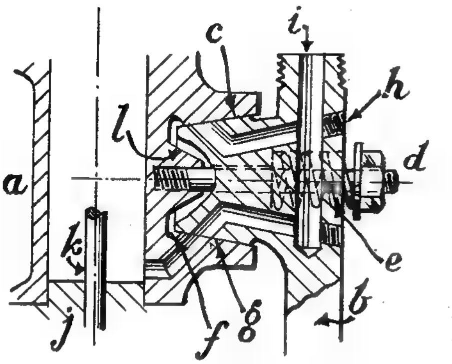


Fig. 3. Section of model boat engine with conical port face

cylinder cannot touch except over their working surface at *c*.

At *g* is one of the ports in the standard in line with a port in the cylinder ; *h* is one of the plugs to fill in the ends of the drilled passageways, *i* is one of the screwed connections, for steam or exhaust, *j* is the bottom cylinder cover, and *k* the piston-rod. This design ought to provide a very long wearing engine for small model steam-boats, bearing in mind also to provide a boss *l* at the back of the cylinder to be sure the pin has a really strong root, and can be fitted carefully in the manner indicated.

Now there is another form of oscillating cylinder in which the " oscillation " covers a few degrees only (Fig. 4). It pushes, or pulls, from the pressure of air or liquid upon its piston, a crank moving through any arc, *a*, and its own oscillation will be seen from the sketch to be confined to the arc *b* ; a few degrees only. At *c* is the eye by which effort is transmitted from the piston-rod, *d* is the plain cylinder barrel, long enough to accommodate the required stroke *e*. At *f* and *g* are the two castings to which the connections are made ; these cause actuation of the piston *h* by air, steam, or hydraulic fluid supplied through the flexible pipes *i* and *j*, the pipe *k* serving to connect *i* with the further end of the cylinder. At *l* is a normal gland, *m* is the piston-rod, made very stiff (the best practice would be to make it hollow if the cylinder unit is to be light in weight, as in aircraft applications). The pin *o*, about which the oscillation takes place, may be fixed to a bracket in any convenient place.

A very important point occurs in these cylinders, which will be apparent from the section at the right of the sketch ; the piston-rod *m* is necessarily large, so the area of the annular space *n* between it and the cylinder *d* is less by a considerable amount, than the normal cross-section of the cylinder. Therefore, unless sufficient allowance is made for this, the area upon which pressure acts upon the return stroke of the piston may not be sufficient to do what is wanted from the cylinder in the situation to which it is applied. These cylinders are extremely useful, in aircraft, for opening and closing shutters, movable cowls, etc., for moving furnace doors in very hot and

(*Continued on page* 408)

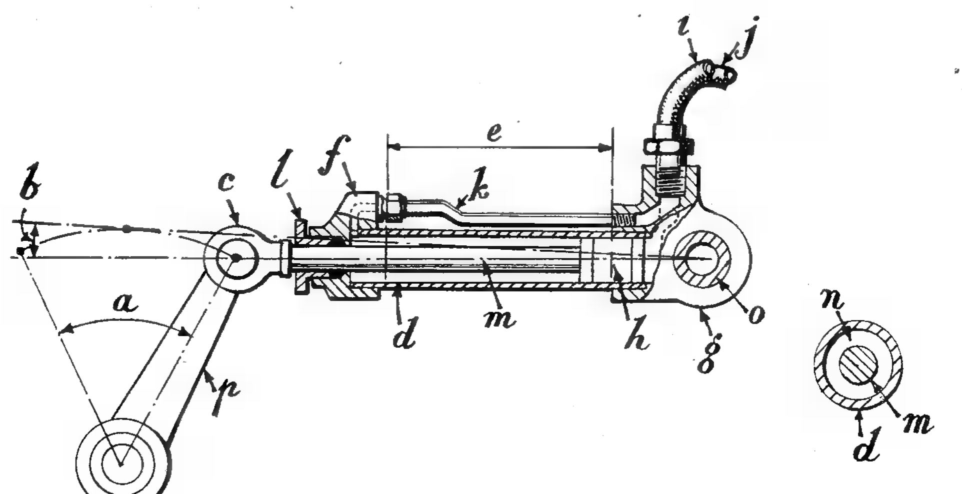
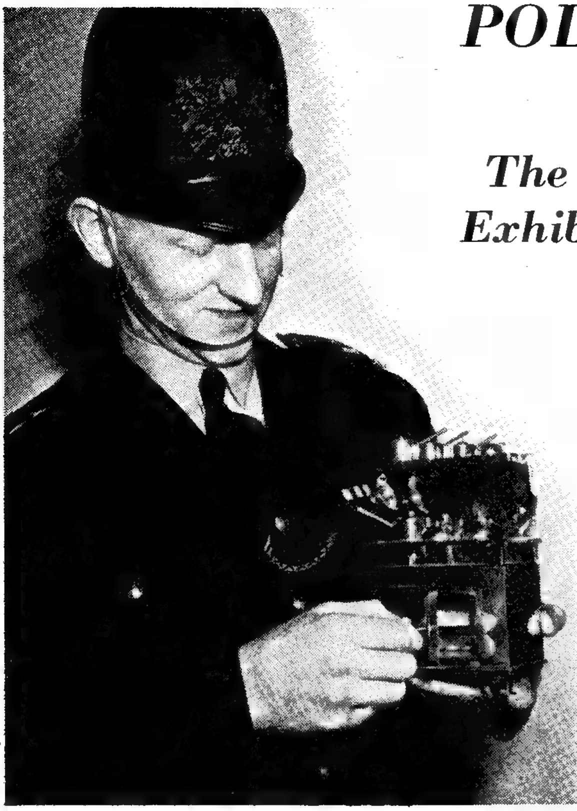


Fig. 4. Oscillating servo-cylinder

POLICE ACTIVITIES!

The City Police hold an Exhibition of Handicrafts and Model Engineering



What's cooking, copper?

THE City Police have scored ahead of their Metropolitan brethren by being the first to put on an exhibition of model engineering and handicrafts!

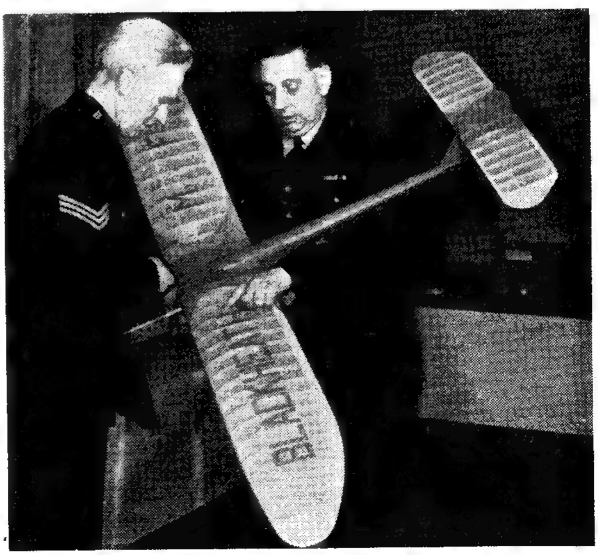
We had the pleasure, a short while ago, of visiting the above exhibition at Snow Hill Police Station, and we were deeply impressed by the variety and quality of the work displayed.

Many readers will already be acquainted with the work of P.C. Bains, H. C., ■ regular exhibitor in the aircraft section at the "M.E." Exhibition, and for 15 years hon. treasurer of the Blackheath Model Flying Club. You see him on this page with his sailplane *Egad II*, explaining some of the more obscure details of wing construction to Sgt. Reeder. To these two enthusiasts must go ■ large portion of the praise for the success of the show.

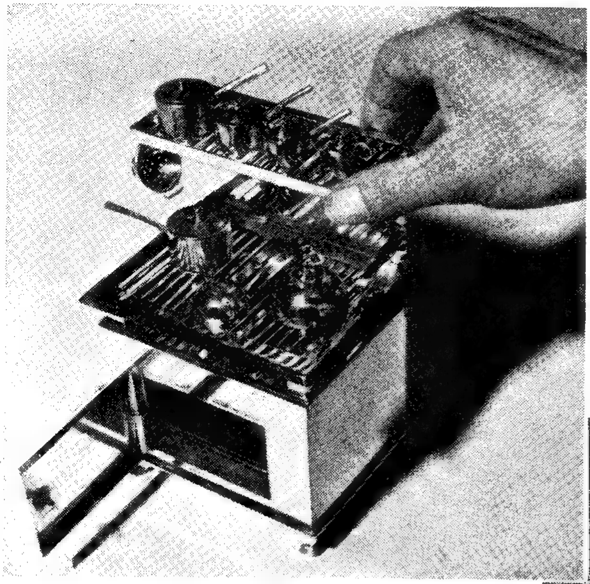
The model engineering (kitchineering?) *piece de resistance* was ■ delightfully executed cooker in brass and copper, complete with pots and pans, kettle, teapots and colander—and all workable! No, you cannot see ■ gas tap; heat is supplied by a spirit stove.

The credit for this little masterpiece (it is only 5¼ in. wide) goes to P.C. Onslow, S., of Stoke Newington, and we hope that he will accept our invitation to enter it in this year's "M.E." Exhibition, August 20th-30th inclusive, at the New Royal Horticultural Hall, Westminster.

Big Ben, as popular with the police ■ with many another model maker, captured the imagination of P.C. Simister, who spent nine months of his spare time on the construction of a very pleasing model. Main materials were mahogany and American whitewood.

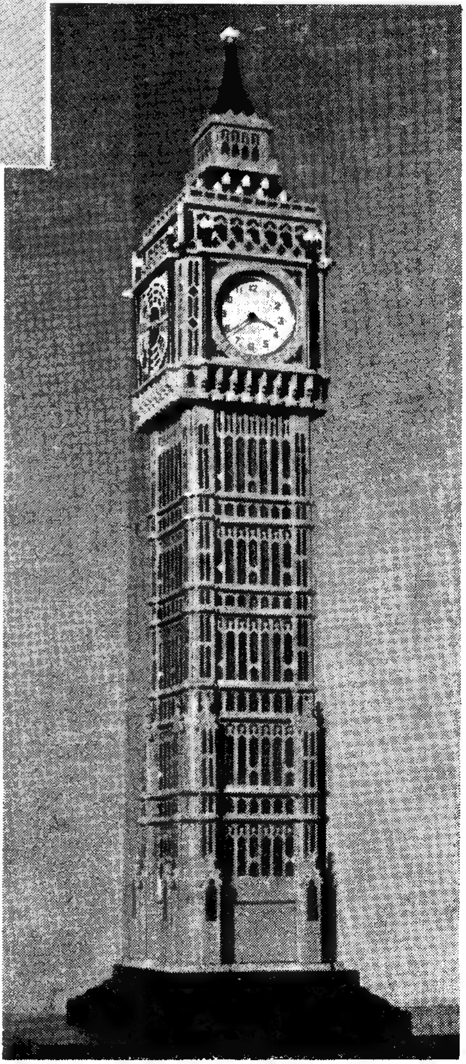


Now, see here, Sarge!



Left—The superb finish of P.C. Onslow's cooker, and Sgt. Reeder's hand !

Below—Big Ben, off the beat !



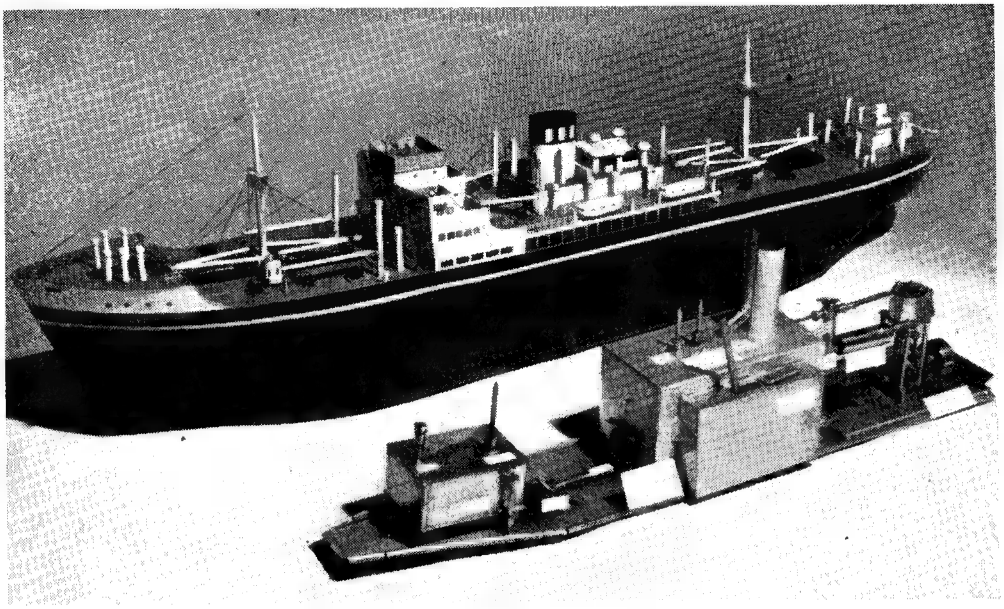
As can be seen in the photograph, the working clock installation has been carried out quite neatly, although not with the correct face and hands. Obviously intended as a utilitarian model, this matters but little, as the object has been well achieved.

Can You Eat It ?

Model engineers have a habit of looking askance at the efforts of the " balsa bashers." Well, the proof of the pudding, etc., and in the next photograph you see another effort, and a most creditable one if we may say so, by P.C. Baines. The good ship *Cypol* (derived from " City Police ") with the red and white vertical stripes of the same company on the funnel, is metal built, with a removable steam power unit (forefront) the various parts of which were labelled for the benefit of the less knowledgeable visitors to the exhibition. We hope to have the pleasure of seeing this model, too, at THE MODEL ENGINEER Exhibition.

Other exhibits included needlework (we mean that), photography, beaten ware, amateur radio and handicrafts in various forms. Without exception, the exhibits were most creditable specimens, which would have borne comparison with the best at any show. We sincerely hope that we shall be given the opportunity to attend bigger and even better exhibitions of C.P. work in the future.

Isn't it funny how things have a habit of happening ? Only the other day, a colleague remarked, " I wonder what coppers do in their spare time ? " Frankly, we hadn't a clue, so our reply was inclined to be in the negative. We did recall, however, seeing a number of them at past exhibitions who displayed a keen interest in the models, and we had a feelng that we should be hearing more about them.



The model S.S. " Cypol " and her plant

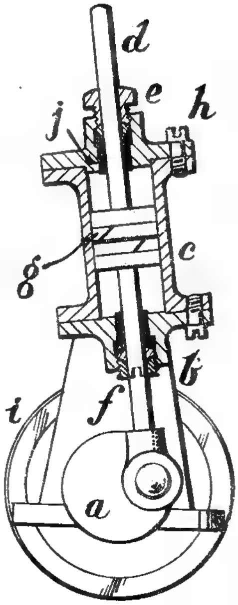
OSCILLATING CYLINDERS

(*Continued from page* 405)

confined spaces, etc., and have been used in large numbers in recent years. In some applications, the crank arm *p*, by which the effort is applied has, for lightness, been made of light alloy, or a steel pressing.

Good Lubrication

For ■ model boat engine, one might suggest ■ construction such as that in Fig. 5, where *a* is the crank disc, *b* the frame, *c* the cylinder, *d* the piston-rod prolonged into a " tail rod," *e* and *f* are glands, with false gunmetal liners *j* for the rod to work in, *g* the piston, *h* the screws attaching the covers, and ■ good heavy flywheel *i* to steady the motion. Such a little power unit ought to have a long life, and be repairable with little trouble when essential parts show inevitable wear. But one point above all is to be attended to with oscillating cylinders in any situation ; the lubrication must be good. Where the cylinder is part of ■ pump forcing oil, this attends to itself, but those cylinders whose function it is to supply power must be adequately lubricated ; a wick which deposits a drop of oil at regular intervals upon the port face would be the best method to adopt.



A Possible Solution

These suggestions and sketches are put forward in the hope that they may show how ■ very simple idea may be developed for widely differing applications and situations ; anyone interested in mechanical design ought to bear in mind, that ■ principle obsolete or inapplicable in one place, may be the best solution in another, and perhaps be discarded for years, and then turn up again in the latest practice, such as the oscillating servo-cylinder unit sketched in Fig. 4.

Fig. 5. Suggested construction of model boat engine

*A SET OF STAGE FOOTLIGHTS

by W. J. Baker

NOW for the front of the " float." Take the lid of the tin and cut as in Fig. 6, allowing $\frac{1}{8}$ in. in all round to double back. Drill holes as shown and fit cross-wires. A 1 lb. reel of 16-s.w.g. bare tinned copper wire should be sufficient for twelve boxes. Before cutting to lengths, put free end of wire in vice, unwind a couple of feet and pull on reel. This not only stretches the wire considerably, but stiffens it also. Then cut the wire to length required, allow for turning over inside holes and stretch taut between opposite holes, (Reflecting surfaces are strictly taboo.) The interior, after priming, should be treated with at least two coats of high grade glossy white. The reflector can be burnished and plated, but in the prototype was painted white (cost again !), and gives excellent results. The top light-traps are painted black on the topside and white underneath. One point here ; don't hurry the painting process. Let each coat dry thoroughly before applying the next—the next three boxes can be proceeded with while this is taking place.

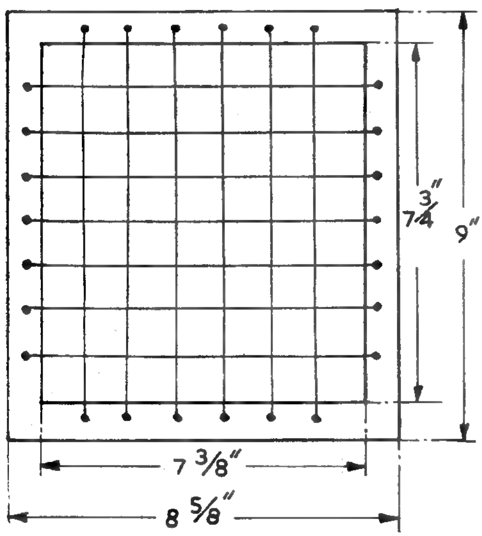


Fig. 6. Front of single footlight, showing crosswire assembly. (For holding gelatines)

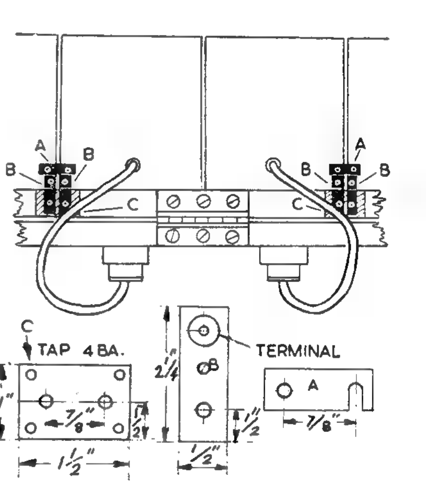


Fig. 7. Details of back fixing and earthing of boxes ; fixing of top to base-plank

soldering into place. Do one side first, as it is essential that wires lying in the same plane should either lie all under or all over the ones lying at 90 deg. to them. *Do not spot-solder the cross-wires.*

Before we start on the painting, two small jobs remain to be done on the box. First, cut two strips of stiff metal to dimensions shown in Fig. 7B and bolt these on to back of the box. The top bolt in each case should have a terminal head for earthing purposes (see later). A hole should be drilled through *every third* box as shown in Fig. 2C to take a securing bolt. Note, however, that the hole in the third box is on the opposite side to that of the first box.

Now choose two more tins of exactly the same size as the first and treat them as for the original. These can then be painted, exteriors first. I suggest a dark chocolate flat paint for the outside.

We are now ready for assembly. First, fit the lampholders. If the cable is a tight fit through the rubber grommet—and it should be—smear a little grease along its length and it will go quite easily. Secure the block in position through base and back of box ; $\frac{1}{2}$-in. wood screws will do this job, but make sure that the points are nowhere near the cable. Fit a 5-amp. two-pin plug to cable-end.

Next fit the reflectors. Bolt these in place, using spacing collars $\frac{1}{4}$ in. in length between sides of reflectors and sides of the boxes to make a snug fit. (With a reflector of dimensions given, the bottom edge lies along the bottom of the box, if the angle of tilt is correct.)

The light traps are bolted on as shown, and the unit " float " is complete. Bolt the three boxes together end-on, using steel bolts of approx. 2 B.A. size with $\frac{3}{8}$ in. spacing collars between boxes (not shown on Fig. 7). These are necessary to facilitate removal of front covers.

Repeat all operations for the remaining nine

*Continued from page 381, " M.E.," March 20, 1952.

boxes, but do not bolt the three-unit sections together.

The base-planks for the boxes are the next items. These planks are 6 ft. in length × $6\frac{1}{2}$ in. × 1 in. and are of seasoned timber, planed and varnished. Two three-unit sections are mounted on each. Take the first plank and at the right-hand end rule a line $\frac{3}{16}$ in. from the edge. The end box is laid along this line. A similar line is ruled at the left-hand end of the second plank—thus when the two planks are placed end to end the footlights form a continuous line with $\frac{3}{8}$ in. gap between the boxes. The remaining sections are fitted end to end (with $\frac{3}{8}$ in. gaps between each three-unit section) along the line of the plank. There is thus a clear length of plank at either extremity. For the back-fixing, cut a steel plate 1 in. × $1\frac{1}{2}$ in. × $\frac{1}{4}$ in. and drill and tap 4 B.A. as in Fig. 7C. Mark the correct position on the back edge of the plank and drill two holes $\frac{3}{8}$ in. dia. 1 in. into the plank. Countersink the plate into position and fix with wood screws. A $\frac{1}{2}$ in. 4-B.A. steel bolt is then placed through each back fixing plate on the box and screwed home into the plate. (A simpler way, of course, would be to dispense with the plate, etc., and to secure the back fixing with wood screws, but this is advisable only if the boxes are never to be dismantled.)

The front fixing is achieved by drilling the plank at the places indicated by the holes already drilled in the boxes. (See Fig. 2C.) A 2-B.A. steel bolt is pushed through each hole in the plank, from the underside, and projects through the bottom of the box, where it is secured by a wing-nut. Note that two such bolts hold down three boxes.

Two planks, again 6 ft. × $6\frac{1}{2}$ in. × 1 in., are used to carry the wiring of the plug-and-socket system. Place one 6 ft. plank under the plank/footlight assembly and mark the positions for each 5 amp. two-pin socket as shown in Fig. 8, making sure that, whatever their position across the width of the plank, these sockets lie immediately underneath their appropriate box. Thus No. 1 socket must be under No. 1 footlight, No. 2 underneath No. 2, and so on. Wire as per diagram using 7/029 in. flat rubber-covered cable. Gouge troughs to take the cable. This looks neater and renders the cable less liable to damage.

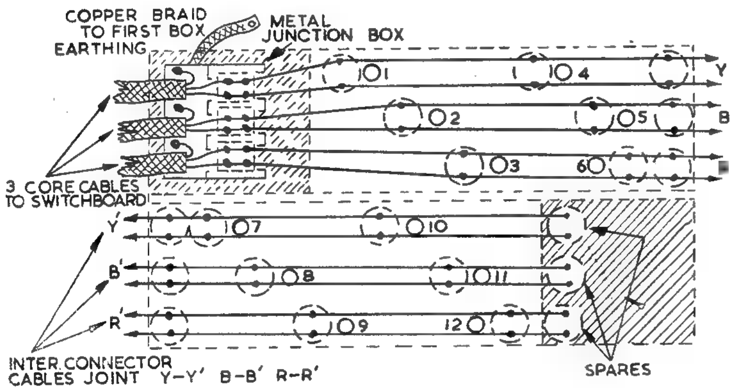


Fig. 8. Wiring diagram of footlights

Note that the two sections of six boxes are not identical. On the underside of one a junction box is fitted. (Which one it is, depends entirely on which side of the stage the switchboard is to be housed.) Connection between the plug, wiring and the flexibles to the switchboard are effected inside this box by means of porcelain two-way connectors. The flexibles used were three-core heavy-duty kinkless cables of the type used for domestic irons, etc. Each of these is terminated in a 5 amp. three-pin plug. Note that the third wire (the earth, by convention either green or brown) is in each case terminated by a soldered connection to the junction box frame-work. A strip of copper braid is also soldered to this box for connection to the earth terminal of the first footlight. For those with no experience of electrical wiring, it should perhaps be added that the remaining two wires in the flexible cable are usually red and black. Next cut copper bus-bars for earthing connections between boxes as indicated in Fig. 7A, and fix these in position.

Having completed the wiring and checked it, little more remains to be done to the footlights proper. The two planks are placed on top of each other and fastened together at the back by hinges fixed at strategic points (Fig. 7). The angle of elevation can be locked in various ways, the simplest of which is the use of two slotted metal arcs mounted on the front edge of each under plank, with two corresponding bolts and wing-nuts on each top plank.

The stands to which the under-planks are fixed are so straightforward as to merit no description ; in any case, the measurements would vary with each individual stage. Sufficient to say then that the footlights stand in front of, and separate from, the stage itself and are supported by wooden stands with an adequate base width.

The switchboard at the control point (Fig. 9) needs but little explanation. It is intended only as a stop-gap until a permanent switchboard is built, and is, in fact, built into an old-fashioned radio cabinet resurrected from the junk heap. The wiring for the rest of the stage lighting has been omitted for the sake of clarity.

These footlights have been designed to use lamps up to 150 watts, but for all usual purposes this will be found to be far too strong ; for the average small stage, 60, 75 or 100 watt lamps would be more than adequate. After all, the main function of footlights is not so much to add to the general illumination as to offset the heavy shadows created by the other lighting.

It will be found that if the lamps are used "bare," the effect will be harsh and unnatural. These footlights have, therefore, been designed for use with gelatine filters. A lot of unkind things have been said about gelatines, but after a careful weighing-up of pros and cons it was decided to use them. Subsequent experience has shown that inadequate ventilation lies at the root of most gelatine troubles; once this has been overcome, and provided they are given careful storage when not in use, they have a long and satisfactory life. Moreover, they are cheap.

As a practical instance; in the early experimental version of these footlights, the lid was cut as now, and the gelatines, bound at the edges with passe-partout, were secured by bolts passing through both lids and gelatines. Result: After being in use a while the boxes warmed and expanded—the gelatines did not, but stretched drum-tight and finally split. In the present system, which is 100 per cent. satisfactory, the gelatines are cut so that a $\frac{1}{8}$ in. margin is allowed all round between gelatine and frame. The gelatines are slid into position between the cross-wires with no other fixing whatsoever. They can be changed in a matter of seconds, the boxes keep cooler, and the gelatines remain as new. There is no noticeable spill of light from the "bare" border.

One further point about gelatines. These can be obtained from any firm specialising in stage light, and from whom a colour chart can usually be obtained. Pink and dark pink are good old stand-bys for the average interior scene, but when the Spectre of Tottering Towers walks, lots of fun can be had with amber, green, blue and red!

Let us assume that the two 6 ft. assemblies are mounted in position end to end. Make up three short lengths of twin flex for interconnectors as follows:—Take one length of flex and terminate one end with a 5 A two-pin plug. Wire the other end in parallel with leads Y^1 (Fig. 8) making a permanent connection to the *underside* of the inner socket. (*Important.* Do not be tempted to terminate this flex with another 5 A plug and plug it into the socket, as this would be dangerous. Neither must the permanent connection be made to the 1st section, i.e. at Y, as this also would result in a live exposed plug.) Repeat the process with the two remaining flexes, connecting them to B^1 and R^1 respectively. To complete the circuits, plug in the three 5 A plugs to the sockets at Y, B and R (Fig. 8).

It will thus be seen that the footlights are extremely flexible in operation. For example, used "straight," i.e. No. 1 circuit on No. 1 section connected to No. 1 circuit on the second section, etc., etc., lamps 1, 4, 7, 10 are on one switch; 2, 5, 8, 11 on the second switch, and 3, 6, 9, 12 on the third switch. But by crossing over the flexible interconnectors, various combinations are possible. Furthermore, any single light may be unplugged or plugged to any circuit

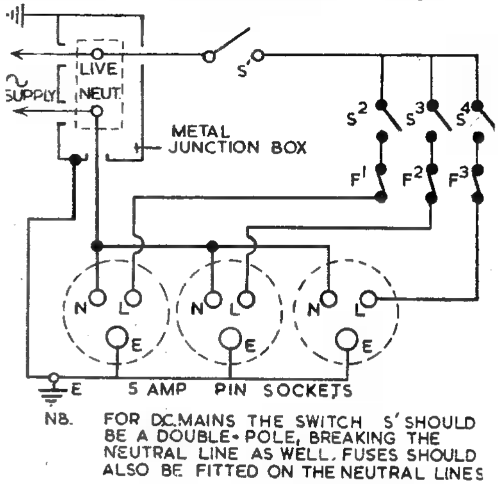


Fig. 9. Wiring diagram of temporary switchboard. Key—S^1 = 15A. Q.M.B. switch (master switch). S^2, S^3, S^4 = 5A. Q.M.B. switches for Nos. 1, 2 and 3 circuits. F^1, F^2 and F^3 = 5A. fuses

to get the exact even light-pattern desired.

The three inner sockets and the three outer ones on No. 2 section are spares—very useful as pick-up points for odd stage lighting jobs, such as fires, etc.

It will be seen, therefore, that considerable variation of light is possible without the use of dimmers, and is more than adequate for the usual stage show. Needless to say, however, dimmers are an asset to any stage lighting and were dispensed with only on grounds of expense.

One final word about the wiring of these footlights. It has been assumed that some electrical experience is available, but if you are a tyro at the job, please get a competent electrician to check it over and Megger the whole thing before use.

Better be safe than sorry!

Headquarters for the Worcester Society

We are pleased to learn that, due to the co-operation of the Worcester City Council, the Worcester Model Engineering Society has negotiated the rental of a piece of land at Waverley Street, Diglis Lane, off Bath Road, and is now very active in putting into effect the plans that, for some time, have been in the minds of the society's members.

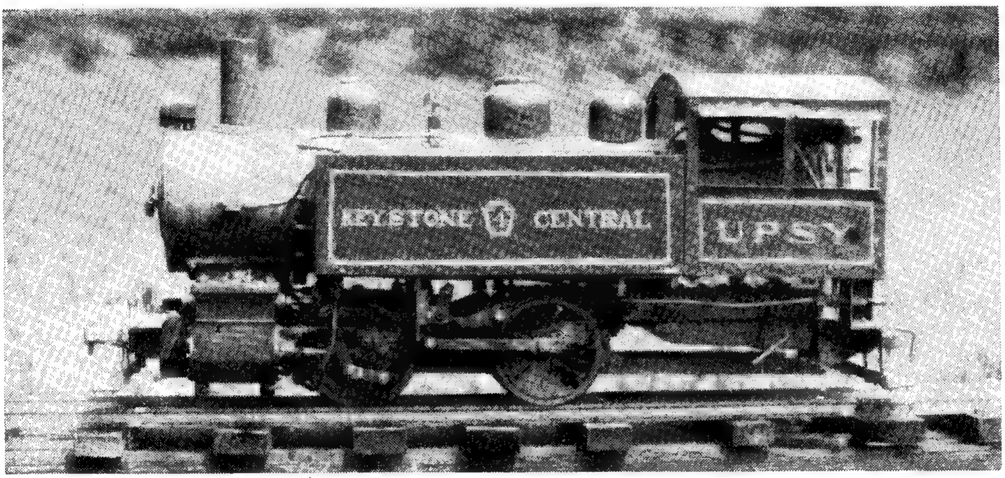
The erection of a clubroom and workshop, the machinery for which has already been purchased, is nearing completion, and a start is shortly being made on the major project, the locomotive track. This will be a continuous track of about one-eighth of a mile and will include $3\frac{1}{2}$-in. and 5-in. gauges. There is also the possibility that, eventually, a car track, tractor track and a boating pool will be constructed in the area surrounded by the locomotive track; so the members of the society will have plenty to occupy their time for the next two or three years!

In the meantime, meetings are held on the first Thursday in each month, at the Labour Club, New Street, Worcester, at 7.30 p.m. The hon. secretary, Mr. F. L. Fudger, 23, Camp Hill Road, Worcester will be pleased to forward full particulars of the society and its activities.

"L.B.S.C.'s" Lobby Chat

"Juliet's" American Sister

THE next batch of construction drawings not being ready yet, we may as well fill the gap with another five minutes in the lobby. New readers who say that my drawings are clear, and easy to follow, may be interested to know that I have never had a lesson in mechanical drawing in my life, so it takes a long time to get them out. Unless otherwise stated, the original drawings from which tracings are made for blockmaking and blueprinting are—as the pavement artist would say—"all my own work"; I mention that, because certain folk have stated otherwise—'nuff sed! To get to business; in addition to the huge number of *Juliets* built according to instructions, there are many "family likenesses" running around; and two of the accompanying illustrations show an American sister built by Mr. Karl Friedrich, of Pittsburgh, Pennsylvania. *Upsy* is much bigger than *Juliet*, as she is a "one-inch-scale" version of a 3 ft. 6 in. gauge engine. Our friend reckons that he is the laziest locomotive builder on earth, and the job was therefore made as simply as possible, the time taken being approximately 750 hours, spread out over a year.



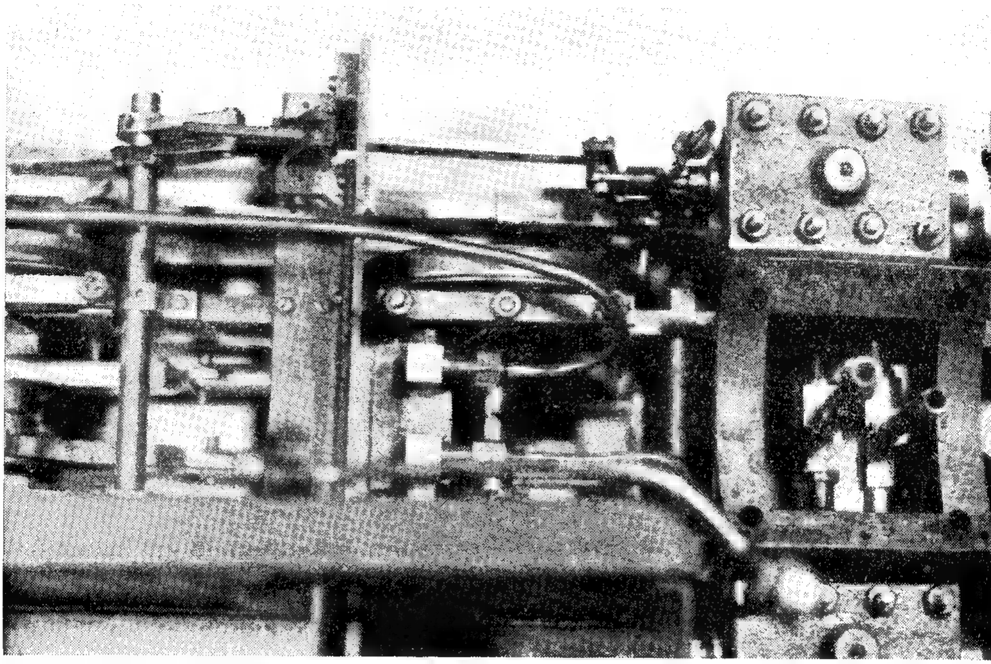
"Upsy-daisy!"

The cylinders, which are $1\frac{3}{8}$ in. bore and $1\frac{3}{4}$ in. stroke, were cut out of a piece of solid bronze rod 3 in. diameter. That sounds like a lazy man's job, doesn't it? They are oiled by a simple displacement lubricator which holds enough oil for about a two-hour run. The steam ports are $\frac{1}{8}$ in. $\times$ $\frac{3}{4}$ in. and the exhaust ports $\frac{1}{4}$ in. $\times$ $\frac{3}{4}$ in., the valves having $\frac{1}{8}$ in. lap. The valve gear is Walschaerts, with box links, the grooves being cut in the lathe. The coupled wheels are $3\frac{3}{4}$ in. diameter. The boiler is 5 in. diameter, 18 in. long, with a wide firebox overhanging the driving axle. The grate measures $4\frac{1}{2}$ in. $\times$ 6 in. The barrel contains twenty-nine $\frac{3}{8}$ in. tubes $10\frac{1}{2}$ in. long, but it has no superheater. It is fed by a twin pump, with $\frac{7}{16}$ in. rams having $\frac{5}{8}$ in. stroke, which can supply far more water than needed. The engine is 26 in. overall length, 12 in. high, and 9 in. wide; and weighs nearly 100 lb. in working order. The fire is started with compressed charcoal (Ford briquettes) and then burns anthracite peas; the boiler steams well, and the engine has far more power than can be used on a short, straight line. Friend Karl took the photographs himself. Well, if the above is the outcome of being lazy—comment is needless!!

A Worcester "Iris"

Hacking cylinders out of the solid, seems to be fashionable nowadays! A well-known retired motor engineer from up North, recently showed me some parts of a *Tich* that he was building for a friend. The cylinders were cut from solid bronze; and were so accurately bored that the pistons were interchangeable. The builder of the fine *Iris*, shown in the reproduced photographs, took on an even more laborious job than that, for he carved his cylinders from two huge chunks of cast-iron! This engine was eight years in the making, being started in 1943 and finished in 1951; the builder, Mr. Cyril Page, of Worcester, being handicapped by lack of time, and of workshop facilities. Much of the work was done by

aid of [redacted] 2-in. Wade lathe and [redacted] very poor specimen of [redacted] vertical drilling machine. The boiler alone took over ten months; but our friend says it is [redacted] wonderful steamer. As he served his time at Swindon, it is hardly necessary to add that he knows the essentials of [redacted] good boiler! There is no need to go into details of the engine, as she conforms to the specifications for this type, which appeared in my notes; full sets of blueprints can be obtained from our offices. For the benefit of new readers, I might add that there is no engine of this particular type running on the Great Western. When those awful caricatures, the Q1 class 0-6-0s, came out on the Southern, they gave me (and many others!) such [redacted] bad "pain in the neck," in a manner of speaking, that I just *had* to design an "antidote"; and where could I find better components to incorporate in my design, than in the Wiltshire locomotive factory? Scores of *Irises* have been built, and I have never yet heard of one that did not come up to expectations of what [redacted] G.W.R. job ought to do; and I offer hearty congratulations to Mr. Page on the fine example that he has turned out under difficulties.



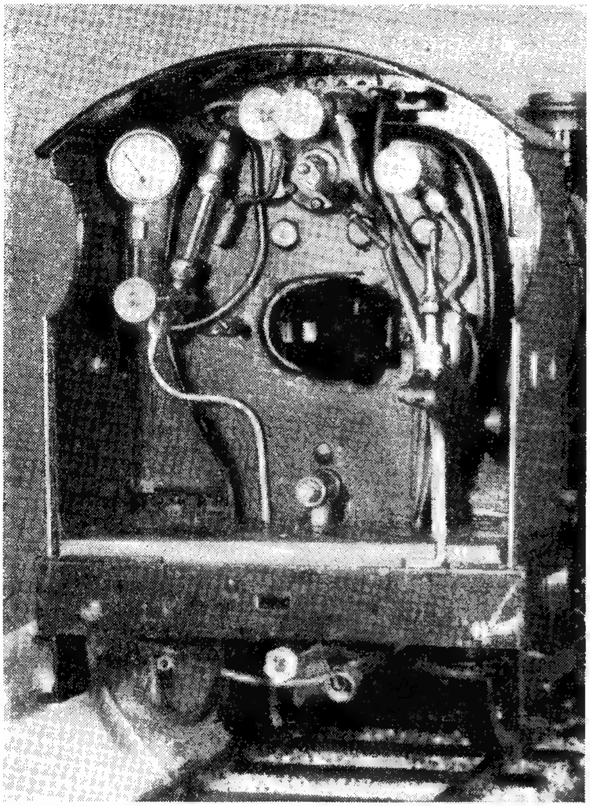
Part of "Upsy's" works

Walschaerts Valve Gear

From time to time, queries roll in on valve gear subjects; and recently I have been asked questions about the relative advantages, or disadvantages, of the different methods of raising and lowering the radius-rod of a Walschaerts gear, so let us now expound. On some engines, such [redacted] the Southern *King Arthurs*, B.R. *Britannias*, and similar types, the reverse or weighbar shaft is placed well above the centre-line of the valve gear, and the lifting arms on each end are attached to the radius-rods by vertical lifting links. On the engines mentioned, they are ahead of the expansion links; in other engines, such as the Maunsell 2-6-0's, they are behind. On many of the L.M.S. engines, class 5's for example, and on most of the L.N.E.R. tender engines, the weighbar shaft is placed level with, and a little to the rear of the bearings of the expansion link. The latter is made double, and the radius-rod passes between the two parts, terminating in [redacted] slotted end carrying [redacted] dieblock. The arms on the end of the weighshaft are pivoted to the dieblocks, and lift the radius-rod direct, without any need for vertical connecting links. This arrangement is very clearly shown in Mr. P. Ward's excellent close-up of the valve gear of Mr. W. Lynch's 5-in. gauge *Green Arrow* type engine *The Dalesman*, reproduced here. On the *Bantam Cock*, and the original *Cock-o'-the-North* types, the weighshaft was close to the link bracket, and the lifting slots were formed in the radius-rod, ahead of the link instead of behind it.

The Whys and Wherefores

The respective pros and cons can be readily understood by the rawest tyro, if he has the average amount of gumption, and I'll endeavour to explain as simply as possible. It is obvious that the bottom end of [redacted] dependent link must swing



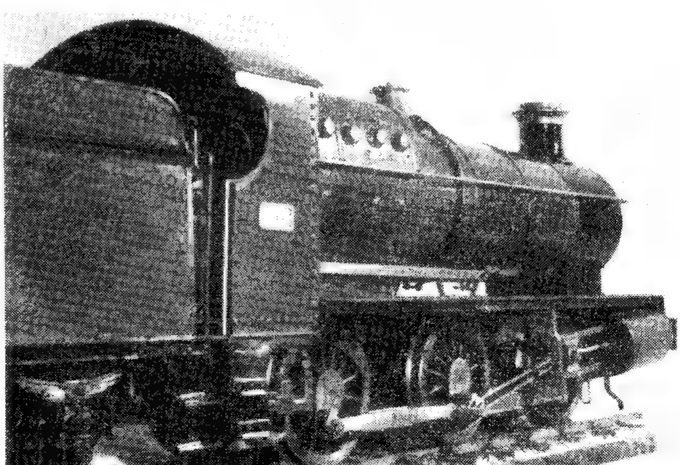
The Worcester "Iris's" footplate

in an arc, and not in a straight line. It is also obvious that if the radius-rod is connected to the before-mentioned link, it must follow its movement. All clear? Right. Now the expansion link swinging on a fixed pivot, the dieblock, when at a point above or below the centre, must also move in an arc; that is, by supposing for a minute that it can "stay put" all on its own. When it is above the centre, the arc will be arch-shaped, the *highest* point in the middle of the swing; when below centre, the arch is upside down, the *lowest* point being in the middle of the swing. Got that all right? Good!

However, the dieblock doesn't have a "free hand," as it is attached to the radius-rod; and if that rod is, in turn, attached to the end of a vertical lifting link, the dieblock *will always swing in the inverted arc*, the lowest point being in the middle of the swing. "Aha!" says our discerning tyro, "now I see daylight! What you are getting at is just this—that when the dieblock is *below* centre, the swing of the dieblock, and the movement of that part of the expansion link, very nearly coincide, thus reducing the slip of the die in the link to a minimum. When the dieblock is *above* the centre, it still swings in the same upside-down arc, *but the swing of that part of the expansion link is dead opposite*, the highest point being the centre. Therefore, the dieblock goes down a little when it should be going up, and consequently the amount of slip in the expansion link is at its maximum." Brother, you said it; that is exactly what happens, and that is why the bottom half of the expansion link is used for going ahead, on most engines with the high weighshaft and vertical lifting links. In forward gear, the die slip is at its minimum, and the valve events are least affected. As the engines invariably run chimney first when working a train, they get the best possible steam distribution in that direction of running.

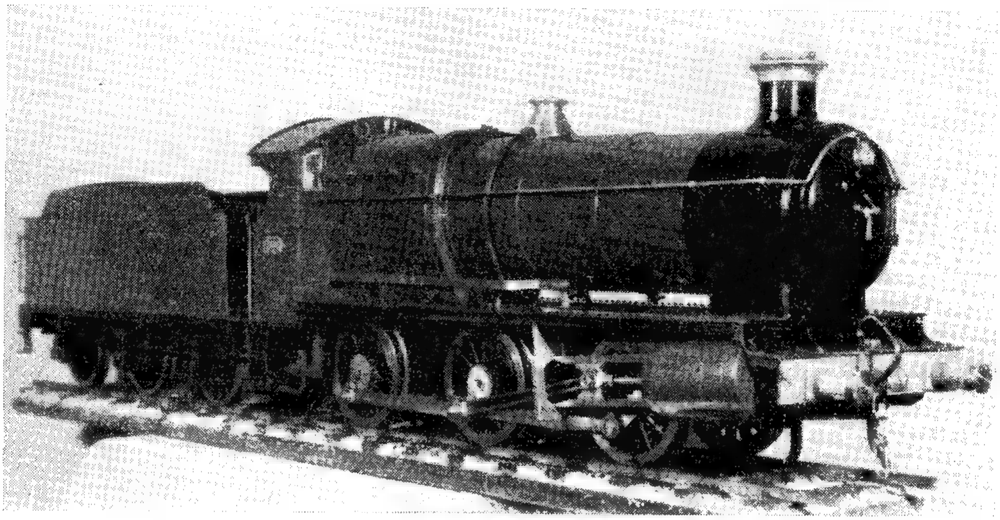
Rear Suspension

Things don't always pan out in the way we would like; and it sometimes happens that owing to the design of the engine, or its wheel arrangement, the lifting arm cannot be coupled to the radius-rod ahead of the expansion link. The only alternative is to operate the radius-rod from a point behind the link, by either of the methods mentioned above, viz. a direct lift, or an ordinary high weighshaft with lifting links connected to the extreme ends of the radius-rods behind the expansion links. In the case of the Maunsell 2-6-0's referred to above, this introduces another factor. Owing to the relative positions of the weighshaft and link brackets,



Very "Swindonesque"!

the lifting arms on the ends of the weighshaft have to be set so that they point towards the rear of the engine, instead of the chimney end, as is usual. Consequently, when the reversing nut on the wheel-and-screw reverser in the cab, is run forward, the ends of the lifting arms rise, and shift the dieblocks to the top of the expansion links. If the lower half of these were utilised for forward running, the engine would run " the brake van, blowing off gently, and the dieblocks were so close to the middle of the expansion links that, from my window, the radius-rod appeared to be still. The beats were perfectly even. It is hardly necessary to add that the poor old cat was in a filthy condition ; but apart from a slight blow at the R.H. piston gland, she appeared to be in good mechanical trim, and was running without knock or rattle.



Mr. C. Page's " Iris "

opposite way to the lever " as the enginemen would say. Exactly the same thing applied to *Tich*, as her reversing arms point to the rear of the engine, and the dieblocks rise when the reversing lever is pushed forward. Mr. Maunsell got over the difficulty in a simple manner, and your humble servant followed his good example, by setting the return cranks so that the upper halves of the expansion links were utilised for going ahead, the engine running the same way as the lever. The " Gipsy-Rose-Lees "—American-built " austerity " 2-8-0's that were much in evidence during the war years, had the same arrangement.

On the Maunsell engines, this meant that in forward gear, the arcs of the dieblock and expansion link were opposed ; and in theory this would indicate that the amount of die slip would tend to upset the valve events. In practice, however, it doesn't appear to make much difference, for two reasons. One is, that the lifting links are not only fairly long, but being connected to the radius-rods at a point beyond the dieblocks, the arc in which the dieblocks move is almost flat. Secondly, these engines notch up so close to middle, when running, that the radius-rod hardly moves, the lap-and-lead movement at the top of the combination lever operating the valves sufficiently to keep the engine going. One of the N class had just gone by, as I wrote the above. She was plodding steadily up the 1 in 264, hauling 46 wagons and ■

The Direct Lift

When the radius-rod is lifted and lowered direct by the arms on the weighshaft, as shown in the accompanying photograph, the dieblock moves in a straight line, and the amount of slip is confined to the arc in which the expansion link moves. It is the same, obviously, whether the dieblock is above or below centre, so apparently would be the nearest to the ideal, for tank engines which run trains either chimney first or bunker first ; but once more we find the usual wasp in the jampot ! This time it is the low position of the weighshaft. Unless care is taken with the laying-out of the valve gear, the coupling-rods will foul the underside of the shaft, when they are passing their highest point. On a $2\frac{1}{2}$-in. gauge L.N.E.R. Pacific which I put in order for a friend many years ago, they actually did hit the bottom of the shaft at every revolution, unless the springs under the coupled axleboxes were screwed up tightly enough to keep the axleboxes at the bottom of the slots ; and that upset the valve timing. The trouble was alleviated by filing a flat at each end of the weighshaft, on the underside, large enough to allow the coupling-rod to clear.

I think that clears up all the points raised in the queries, and may save new readers and beginners some exercising of grey matter in their noddles. Each type of lifting arrangement, mentioned above, is operating in everyday service at the present minute, and giving satis-

factory results. My own preference is for the high weighshaft with the vertical lifting links connected to the radius-rods in front of the expansion links, and as close to them as possible, as on *Britannia*. This particular arrangement, with the double lifting arms, one at each side of the link, is compact, and gives a direct lift; and the connection ahead of the expansion links allows the latter to be of the simplest possible form of construction, viz. a single slotted plate with a trunnion at each side, and a single dieblock for each link. I am using a similar arrangement for an experimental 2-6-2 which I am building "in parallel" with *Britannia*. Details in due course.

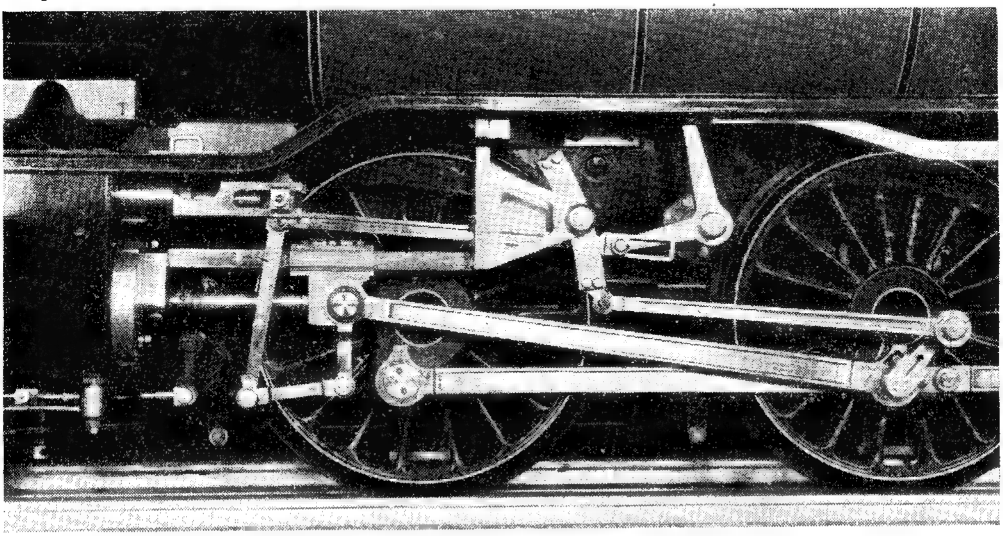


Photo by] [*P. Ward*

Valve gear of Mr. W. Lynch's 5-in. gauge 2-6-2 "*The Dalesman*"

Easily-machined Brake Blocks

A little while ago, time of writing, I received from Mr. W. H. Haselgrove, who sells castings for "live steamers" described in these notes, a novelty in the shape of a set of *Tich* brake blocks cast in a ring. This reduces the machining to the rockbottom of simplicity; because all there is to do, is to chuck the ring in the three-jaw, bore it out with an ordinary boring tool to the diameter of the coupled wheels (2 in.), saw off the brake-blocks, drill the pinholes, and put the finishing touches with a file. I've no shares in the business, and don't draw commission—I just thought it was a useful time-saving tip which was well worth passing on.

"Queen Mabel"

The brief description of the "super-locomotive" in the Christmas tale has aroused a considerable amount of interest among our fraternity; and many queries have come in as to the possibility of my describing in full detail how to build a $3\frac{1}{2}$-in. gauge edition of her. The trouble is that there is only one Curly, nearly worn out at that, who at the moment has a "full plate," describing and making drawings for *Britannia*, the second edition of *Juliet*, and various other commitments; but for the benefit of a few sceptics, I'll say right here, that *Queen Mabel* is no "flight of fancy" but a practical proposition. The special features, such as the two piston-valves per cylinder, giving separately-adjusted admission and release; the automatic water scoop; the cab signalling; the self-opening blower valve, and other details, are all schemed out, same as were the details of *Lady Vera*, the "simple-compound," and the four-cylinder 4-8-2, which I described briefly in previous tales. It is no "hot air," nor stupid boastfulness, but a plain statement of honest fact, to tell readers that during over half a century of actual locomotive-building and experimenting, I have found out much that I have not hitherto disclosed, and as I have a fully-equipped workshop, and a little railway of my own, it is easy enough to prove in actual practice whether an idea is right or wrong.

As a matter of fact, startling confirmation of the fact that *Queen Mabel* is a practical proposition, has just come to hand from Mr. W. B. Hockings, of Taunton, an engineering draughtsman who has what I call "a head for figures"; not the "theoretical" kind, but calculations based on actual practice. He has made a development drawing of the engine, as she would be in full size, with enlargements of various details, including the twin-valve cylinders, and obtained some data. The grate area would be 82.4 sq. ft., the combined heating surface 5,490 sq. ft., the total weight of engine and tender 233 tons, and the tractive effort 66,000 lb. More details later, if all's well.

*BALANCING SMALL ENGINES

Notes on basic principles and practical methods of procedure

by Edgar T. Westbury

THIS rule applies, whether the engine is single- or double-acting, and whatever method is employed to convert the reciprocating motion of the piston to rotary motion of the crankshaft. I emphasise this point because I am often asked to prescribe a " perfect " balancing formula for a single-cylinder engine, and some fearfully and wonderfully conceived devices—all of them either futile, or too complex for practical application—have been submitted by designers as a solution to this problem.

In the orthodox arrangement of a single-cylinder engine, the piston is linked to the crankshaft by a rigid connecting-rod, either directly, or through a piston-rod and crosshead. The piston (with rod and crosshead, where fitted) and its wrist or gudgeon-pin, are, of course, pure reciprocating weight ; the connecting-rod reciprocates at the " small " end and rotates at the " big " end ; while the crankshaft and all its appurtenances are pure rotating weight. In any attempt to balance an engine, the two orders of motion must be isolated, so far as is practicable, and thus one of the first things to do is to assess the amount of counterweight which must be applied opposite the crankpin to balance out all the rotating weight.

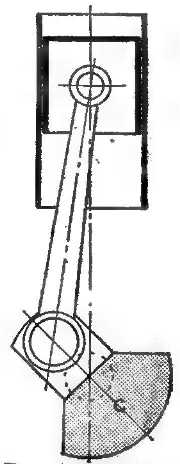


Fig. 5. Single-cylinder single-crank engine, partially balanced by counterweight

A Misleading Term

One point which should be carefully borne in mind here is that the term " weight " in balancing formulae may be rather misleading, as what really matters is " moment of mass." A comparatively large weight on one side of the axis, in a rotating body, may be cancelled out by a smaller weight acting at a greater radius on the other side, or vice versa. Similarly, a large reciprocating weight may be cancelled out by a smaller weight having a longer stroke, i.e. moving through a greater distance in the same time, or vice versa. These things look after themselves when static or dynamic tests are made, but they can, and often do, complicate matters when one attempts to work out problems by calculation alone.

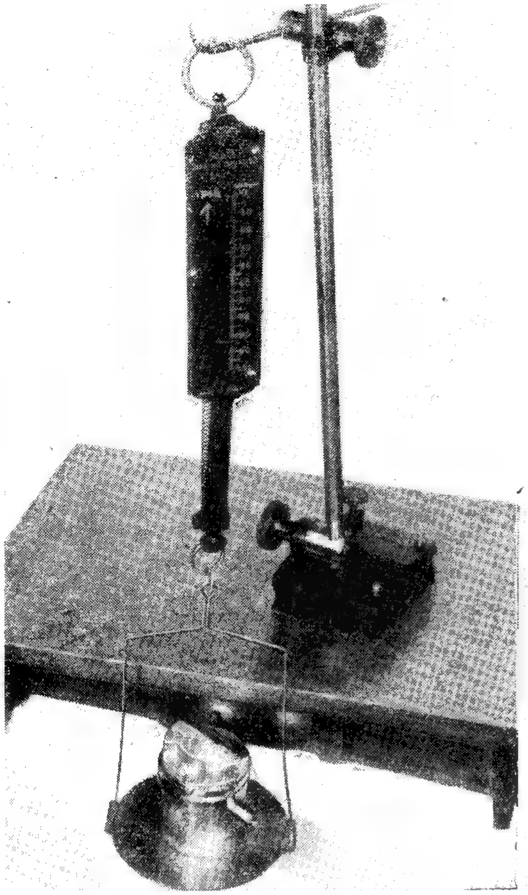
In the simple engine shown diagrammatically in Fig. 5, the balance weight may either be made integral with the crank web or attached to it in any convenient and secure way. It must, primarily, have sufficient moment of mass to balance out all the rotating weight in the system ; but if no more than this is accounted for, it leaves the whole of the reciprocating weight of the piston, gudgeon-pin and small end of the connecting-rod unbalanced. The result is that a powerful reaction force, tending to cause vibration in the plane of the piston motion, but opposite in phase, will be set up when the engine is running.

If now sufficient mass is added to the counterweight to cancel out entirely the reciprocating weight, it will be clear that when the piston is moving downwards at maximum velocity (i.e. at mid-stroke), the counterweight is moving upwards at such a rate as to cancel out the unbalanced reaction ; and at the same point in the up-stroke, the downward movement of the balance weight is also in direct and equal opposition. But whereas the rate of motion of the piston varies from zero to maximum on each stroke, that of the counterweight is constant, so that the latter itself becomes unbalanced when the piston is at the top or bottom of its stroke. The result is that the vibration in the plane of the piston movement may be more or less completely cancelled out, but in its place is substituted a vibration, practically of equal magnitude, at right-angle to the plane of piston movement. The last state is, therefore, no better than the first.

Partly Cancelled Out

In practice, the best results are obtained by using a counterweight capable of cancelling out only a portion of the reciprocating weight. The exact amount is often a subject of fierce dispute, but in actual fact it depends on a number of (sometimes incalculable) factors, such as the way the engine is mounted, the moments of inertia in the fixed and moving masses (which influence " critical speeds "), and so on. What really happens is that some of the forces which tend to cause vibration are diverted into other planes, where they may be more tolerable, or

*Continued from page 337, " M.E.," March 13, 1952.



Weighing the piston with rings and gudgeon-pin

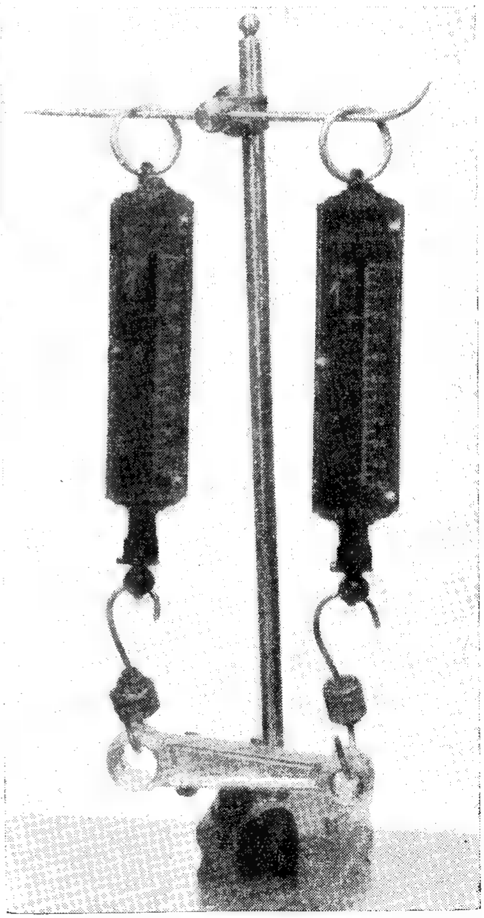
more readily absorbed in the structure ; in no case is the vibration in a single plane so violent as it would be in an entirely unbalanced engine.

As a general rule, it may be said that engines which are required to run at widely varying speeds require a greater portion of reciprocating weight to be balanced out than those which can be kept running at well above critical speed. In some small high-speed engines it is possible to " get away with murder," by using very sketchy balance weights, or even none at all. This is because the reciprocating parts of these engines can be made extremely light, and their structure resilient enough to absorb vibration ; but it should be remembered that the unbalanced forces are still there, and are registered in the mechanical stresses and bearing loads, also that these forces have to be generated by the engine itself, thereby detracting from the power available for useful work.

In most of the engines which I have described in THE MODEL ENGINEER, I have found it satisfactory to balance out about half the reciprocating weight, except in one or two cases where the engines were designed for special purposes. The methods employed in finding the correct counterweight to apply to the crankshaft are illustrated here, in the following order :

First, weigh the piston, complete with its rings, gudgeon-pin, and pads, or other retaining devices (this is pure reciprocating weight). It may be mentioned that sufficient accuracy for this purpose may be obtained by using a simple spring balance (since it is only necessary to find *comparative* figures), and a suitable type of balance has been obtained from the surplus market, as advertised in THE MODEL ENGINEER.

Second, weigh the two ends of the connecting-rod, either separately or simultaneously (preferably the latter) keeping the rod quite horizontal during the process. The small-end is taken as

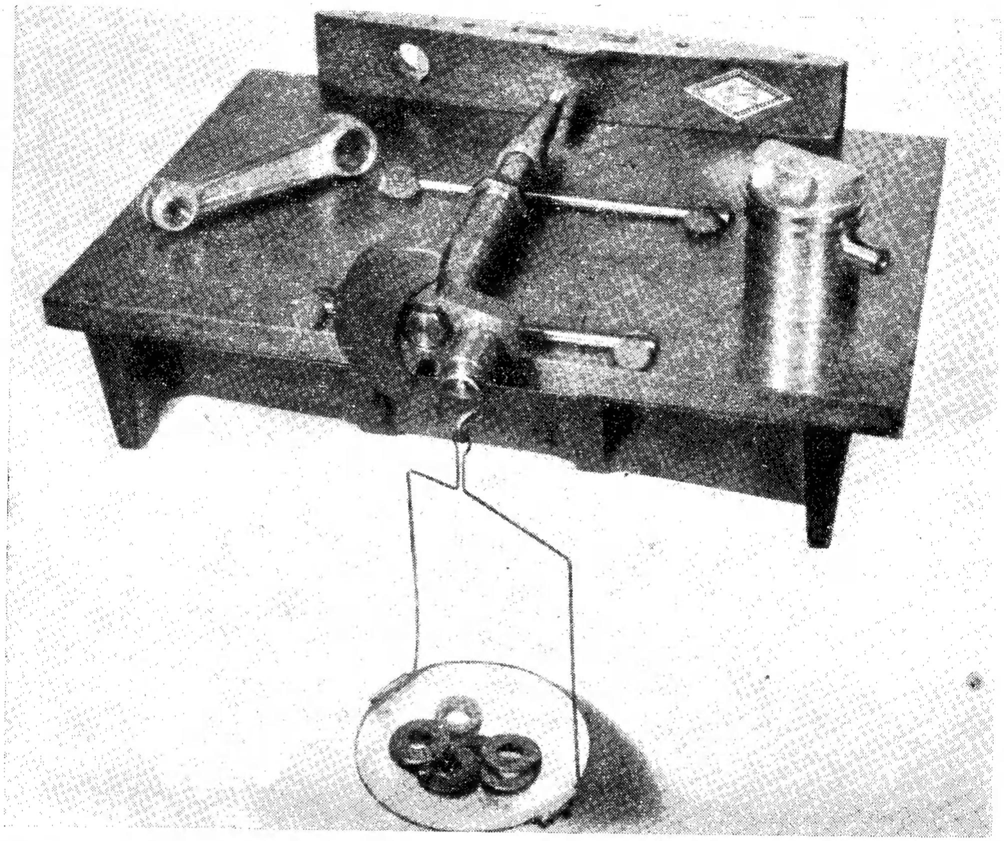


Weighing both ends of connecting-rods simultaneously

reciprocating weight, and the big-end as rotating weight.

Third, assess the amount of weight to be cancelled out in the counterweight. This is done by adding together reciprocating weights of the complete piston assembly, and the small-end of the rod, which (if we accept the proportion recommended above), is then halved, and added to the rotating weight of the big-end.

Fourth, the crankshaft is poised on knife suitable material to hand ; as may be seen, metal washers were used in the case illustrated. In the absence of a scale pan, a small bag may be used. It is important that the means of suspension on the crankpin should be arranged to produce the minimum friction. In the example shown, a small plug was made to fit inside the hollow crankpin (its weight being duly allowed for), having an extended pin of small diameter, on which the hook of the scale pan was hung.



Counterpoising the crankshaft by hanging weights on the crankpin, as calculated from piston and connecting-rod weights

edges or rollers, to act as a balance, and the assessed weight is hung on the crankpin ; the counterweight is then adjusted until it "stays put" in any position of rotation. This may entail either adding or subtracting metal at the counterweight, such as by fitting lead "slugs" in suitable recesses where they cannot be thrown out centrifugally, or by filing or machining away the surplus. In some cases, lightness of the balance weight may be remedied by reducing the web on the crankpin side, or enlarging the centre hole in the latter, always having due regard for retaining a margin of mechanical safety.

The weight necessary to carry out this operation may be made up from sand, lead shot, or any

The figures in the example illustrated are as follows :

Piston, with rings and gudgeon-pin ..	83 grms.
Small-end of connecting-rod ..	21 „
Big-end of connecting-rod	25 „

$\left(\frac{83 + 21}{2}\right) + 25 = 77$ grms. = amount to be cancelled out by counterweight.

Should the designer adopt a different figure for the proportion of reciprocating weight to be balanced, this part of the calculation must be suitably modified. This formula, however, has been used with success, not only in models, but also for larger engines which have had to work under exacting conditions.

I have described this procedure in detail, as it is of interest to a large number of readers, to judge by the number of individual queries I have had to deal with, and I trust that this will clear away the last remnants of mystery regarding this subject.

I have stated that these conditions apply to any orthodox single-cylinder engine; it is also correct for machines having a similar order of motion, such as high-speed pumps or air compressors. Balancing problems should not be confused with effects caused by working pressures, though these produce their own reactions, and may affect smoothness of working. In many small machines which are not required to run at very high speeds, little attention is given to the finer points of balancing, and within certain limits, the results are fairly satisfactory.

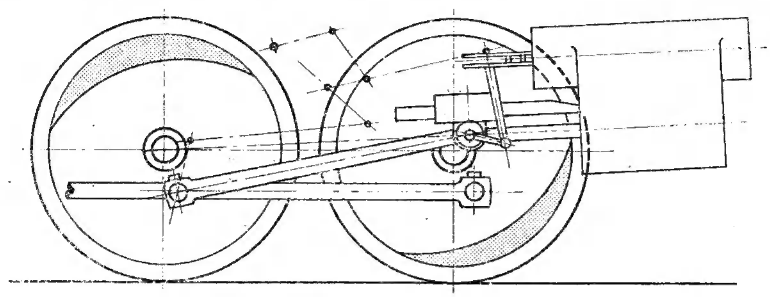


Fig. 6. In balancing locomotives, the balance weights are often put out of phase on adjacent coupled wheels, to avoid the effect of simultaneous impact on the rails

Locomotive Balancing

Constructors of small locomotives do not usually take a great deal of pains, either by calculating unbalanced forces or by experimental tests, though the balance weights of full-sized locomotives are usually copied more or less correctly to scale. It may be mentioned that the principle generally adopted in locomotive balancing is to treat each set of cylinders and motion work as a separate single-cylinder engine, as shown in Fig. 5; it can thus be dealt with in the manner already described. Balance weights may sometimes be distributed over all the coupled wheels; the coupling-rods, it should be noted, are taken as rotating weight, as any single point on them describes a true circle. Linkages, such as those used in certain types of valve-gear, however, have more complex orders of motion, and are difficult to balance; fortunately their mass and velocity can be kept fairly low, at least on any locomotives likely to be built by readers of THE MODEL ENGINEER.

It may be observed that the balance weights on the different coupled wheels of some locomotives are placed out of phase, so that they do not all oppose the crankpin; there are various reasons for this, one being that it is possible for the combined reactions of three or more balance weights, moving simultaneously, to produce the effect of a hammer blow on the rails; the locations of the weights are, however, arranged to produce, in combination, the correct moment of mass and phasing to balance the motion work as well as possible. (See Fig. 6.)

If one wishes to study the subject of locomotive balancing in greater detail, it may be noted that an authoritative book on the subject was written several years ago by Professor Dalby, and may still be available for reference in technical libraries.

Steam engines having several cylinders, especially those of multiple-expansion type, where the pistons vary in size and mass, present special balancing problems, and these are accentuated by the fact that the disposition of the cranks must be arranged to avoid dead centres, so that the engine can be started from any position without outside assistance. In large marine engines, the Yarrow-Schlick-Tweedy system of balancing, which involves a special method of unsymmetrical crank angle spacing, is usually employed. In such engines, it is not usually convenient to fit balance weight to the crank throws, but the shaft and bearings are sufficiently rigid and firmly mounted to allow of using the unbalanced masses of one or more pistons to cancel out those of adjacent pistons.

Balancing Multi-cylinder Engines

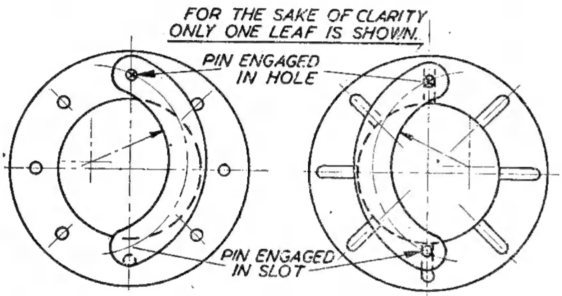
Before dealing specifically with engines having more than one cylinder, it may be mentioned that there is one type of single-cylinder engine in which perfect dynamic balance is possible; namely, the opposed-piston type, in which two pistons moving in opposite directions are used in one cylinder. The advantages of this type, however, are somewhat marred by the fact that its mechanical arrangement is more complex, and often convenient or inefficient; it is much better suited for dealing with the heavy masses in very large slow-running engines than for those of small high-speed engines, where the improved dynamic balance may hardly be perceptible under practical conditions.

(To be continued)

PRACTICAL LETTERS

Camera Design

DEAR SIR,—In case anyone is thinking of constructing an iris diaphragm similar to the one illustrated on page 143 of THE MODEL ENGINEER dated January 31st, I should like to point out the design illustrated would be unlikely to give satisfaction. It suffers from two serious defects. In the first place, a very small movement of the control ring would move the iris from fully open to shut, so that fine adjustment is practically impossible. In the second place, any backlash in the working parts would be magnified owing to the short distance between the actuating pins which move the leaves, and, therefore, any calibration would be meaningless.



A much more satisfactory arrangement is that in which each leaf has two pegs, one at each end but protruding on opposite sides. There are two annular motion plates, one with a circle of holes and one with radial slots, into which the pegs on the leaves engage. The diagram explains it better than the written word.

I made a large iris diaphragm to this pattern some time ago and it has been very satisfactory. The design minimises backlash and gives a considerable movement at the actuating ring so that the calibration can be made with accuracy.

Yours faithfully,

Bradford. T. B. ROSE.

Test for Stainless-Steel

DEAR SIR,—In THE MODEL ENGINEER dated February 28th, Mr. Spence asks for a method of identifying stainless-steel. Fully stainless type is non-magnetic and other types only feebly so.

Yours faithfully,

Dublin. D. H. HAYDEN.

The Darby Digger

DEAR SIR,—I have been a reader of THE MODEL ENGINEER since 1919 and this is the first time I have dared to address you. However, I was so interested in the recent notes on The Darby Digger that I feel a few words may not be out of place.

The digger shown on page 230 of February 21st issue is without doubt a Savage; this is shown by the gearing if nothing else. Savage made two types, a large and a smaller; the large one is shown in the short history of the firm by R. H. Clark entitled 100 *Years Not Out*, also in his book *Steam Engine Builders of Norfolk*.

The large digger could operate over an area of 21 ft. dug ground, the small one on 12 ft. It is a smaller one which is shown on page 230. The digger shown on page 622, THE MODEL ENGINEER, May 17th, 1951, is one of the smaller ones built at Pleshey Lodge Farm by T. C. Darby between 1877 and 1895. In these, the arrangement of gearing was different, and as the boilers and cylinders were made for the first three at any rate by Eddington and Stevenson of New St. Ironworks, Chelmsford; as regards engine work at any rate, they followed their then standard single-cylinder traction practice.

There is nothing missing in the engine on page 622, THE MODEL ENGINEER, May, 1951, merely that the fork drive shaft is disconnected and the wheels slewed for road travel.

Yours faithfully,

CHAS. THETFORD.

Bishops Stortford.

DEAR SIR,—I was very interested in the picture and description of the Darby Digger in "Smoke Rings," but, on looking at the photograph closely, I feel sure I can discern five digging forks, not four, as you say.

As far as I can see, there appears to be three beat throws to the crankshaft, with the addition of a disc crank at each end. I did think at first that perhaps the fork nearer the camera was some kind of anchor, but its fellow at the other side is well above ground, so I still think five forks it must be.

I've no doubt you will receive some other letters on this subject.

May I conclude with best wishes to "Ours," and please continue to find room for any news and articles about any kind of traction engines, fairground equipment, etc.

Yours faithfully,

London, W.7. C. W. LONG.

Steam Organs

DEAR SIR,—As you know, I have always been interested in steam, and I well remember in my youth my parents referring to the steam organ on a roundabout, and I was all excitement till I was taken to the fair, where my chief interest naturally was in the road locomotives and roundabouts.

My disappointment, however, was considerable when I could see no steam issuing from the organ, and it was not until some years later that "the penny dropped" and I realised that the organ was merely driven by a steam engine and worked by air.

Some years ago I made one of my rare visits to the cinema and saw an American film in colour dealing with the travelling show business. The characters were played, if I remember correctly, by Victor Mature, Carole Landis, and Rita

Hayworth. One of the scenes in the film depicted a show parade through the streets of a provincial town, and childhood memories were forcibly impressed upon me when I saw to my extreme amazement, a device being pulled along on wheels, with large brass organ pipes protruding from the top of what may have been a large brass or copper boiler, with steam issuing from them alternatively, playing a simple tune in somewhat hollow tones.

I wonder if anyone else can remember actually seeing an organ working on steam?

Yours sincerely,

Brighton. S. R. BOSTEL.

Useful Lathes

DEAR SIR,—Your correspondent, W. Kirkham (THE MODEL ENGINEER January 3rd, 1952), is right on the mark when he says " . . . the lathe is the main tool." My 4½-in. lathe, built in Melbourne is a regular maid of all work. Being the only powered tool I possess, it does all the odd jobs in addition to its orthodox turning and drilling. Twice a year, by means of a pulley held in the 3-jaw, it drives a centrifugal honey extractor (built for manual operation) and does a very sweet job. It also hoists bales of hay up to the loft overhead by means of a warping drum held in the 3-jaw. Occasionally it handles a huge kite for the youngsters in the back paddock, and by means of a buffing wheel, it cleans their shoes when an extra finish is required. Another regular job, which it does very well, is sawing, a 7-in. circular saw being fitted and removed in a matter of seconds. Which recalls a scene I witnessed a few years ago in Melbourne—a friend had an old 9-in. lathe about 14 ft. long. He never used more than half the bed, so converted the outer 7 ft. of the bed to a planer; attached two pairs of legs near the middle, and as a final indignity, mounted a hacksaw by means of a makeshift crank, and compelled the unfortunate lathe to cut itself in halves. I might add that both the shortened lathe and the planer are most efficient machines.

Yours faithfully,

Melbourne. NORTH-5-WEST.

The "Shore's" Collection

DEAR SIR,—I have been asked to bring to your notice, your Smoke Ring of January 31st, 1952, in which it is reported that the entire Rev. Shore collections are housed in the Ford Museum in U.S.A. Our chairman, Mr. J. Weighell, was at one time a personal friend of the Rev. Shore, who lived in this locality, and he states that a number of his models were given to friends, and also in the Darlington Museum there is a triple and quadruple marine engine and lighting set, also one or two stationary engines which were the Rev. Shore's. In view of this information, we felt we couldn't let America get away with the credit this time, more so because of its local interest.

In closing, may I, on behalf of the Northallerton & District M.E. Society, wish THE MODEL ENGINEER every success in keeping alive a hobby of real worth.

Yours sincerely,

Northallerton. A. DIXON.

CLUB ANNOUNCEMENTS

The Farnborough Society of Model Engineers

The above society held its first exhibition on February 23rd and 24th and it was, we are glad to report, a success right from the start. The chairman of the local council, Mr. S. L. Collier, opened the exhibition on Saturday afternoon when the hall was packed to capacity.

A spirit-fired "O" gauge locomotive was busy running on an oval track and caused a great deal of interest, as did a 3½-in. gauge "Schools" class chassis running under compressed air. Both of these models were built by the society's treasurer, Mr. F. Tucker.

Several other fine models were on show including a large number of boats and aircraft; also, a large "OO" gauge layout. The trade was represented by three of the local model engineering firms who had stands at the show; also, a well stocked bookstall.

Among the visiting clubs was the Aldershot S.M.E. who had a well-filled stand.

Visits to places of engineering interest are to be arranged, as are film shows.

Full details from the Hon. Secretary, D. JENKINS, 16, Hurst Road, Hawley Estate, Farnborough, Hants.

Aylesbury and District Society of Model Engineers

A recent meeting was devoted to a model night. Among the models on view, all of which were locomotives, was a Great Northern tender built by Mr. E. D. Hasberry, and a "Pamela" class chassis. This locomotive has progressed considerably since we last saw it, and its builder, Mr. C. Gill, has continued his excellent standard of workmanship.

On the "O" gauge side, Mr. Stevens brought along the beginnings of his "fine scale" layout, which promises to be most interesting when it is completed.

Hon. Secretary: E. H. SMITH, Mulberry Tree Cottage, Devonshire Avenue, Amersham, Bucks.

South London Model Engineering Society

The next meeting of the society will be the annual genera meeting on Sunday, April 6th, at 11 a.m.

On Wednesday, April 9th, Mr. A. T. Cassenet will describe the construction of his new boat, *Miss Brockwell*, at 7.30 p.m.

April 23rd, at 7.30 p.m., Mr. A. Miller tells how he constructed his drilling machine.

All meetings take place at our new headquarters, The White Horse Hotel, 94, Brixton Hill, S.W.2.

Visitors are welcome while any keen model engineer who would like to join the society can obtain particulars from the Hon. Secretary, W. R. COOK, 103, Engleheart Road, Catford, S.E.6.

Colne and District Model Engineering Society

This society has recently been formed to bring together all in the district who are interested in any form of model engineering.

We are at the moment negotiating for a room in the Colne Technical School where it is hoped to hold meetings every fortnight, in the meantime anyone interested in any form of model engineering should contact the Hon. Secretary, C. D. HUDSON 21, Primet Hill, Colne, Lancs. Tel. 325.

North London Society of Model Engineers

The March meeting was held as usual in the Gas Boards Office, Station Road, New Barnet, and large audience enjoyed a most practical lecture on steam injectors by Mr. Lee. Dealing simply with basic theory and troubles experienced with some existing designs, the lecturer went on to explain several satisfactory models he had recently constructed, illustrating with drawings and examples both large and small.

The members had the opportunity of seeing an electric generating plant at work under steam.